DOCUMENT RESUME

ED 092 503 95 SP 008 092

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TITLE A Technology for Developing Instructional Materials. Vol. 3, Handbook. Part A, Plan Study of Criterion Behaviors.
INSTITUTION American Institutes for Research in the Behavioral Sciences, Pittsburgh, Pa.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
PUB DATE Mar 73
CONTRACT OEC-0-70-4776(520)
NOTE 208p.; For related documents, see SP 008 090, 091, and 093-104

EDRS PRICE MF-$0.75 HC-$10.20 PLUS POSTAGE
DESCRIPTORS *Assignments; *Behavioral Objectives; Development; Educational Development; Educational Research; *Guides; Instructional Materials; Manuals; *Personnel; *Research and Instruction Units

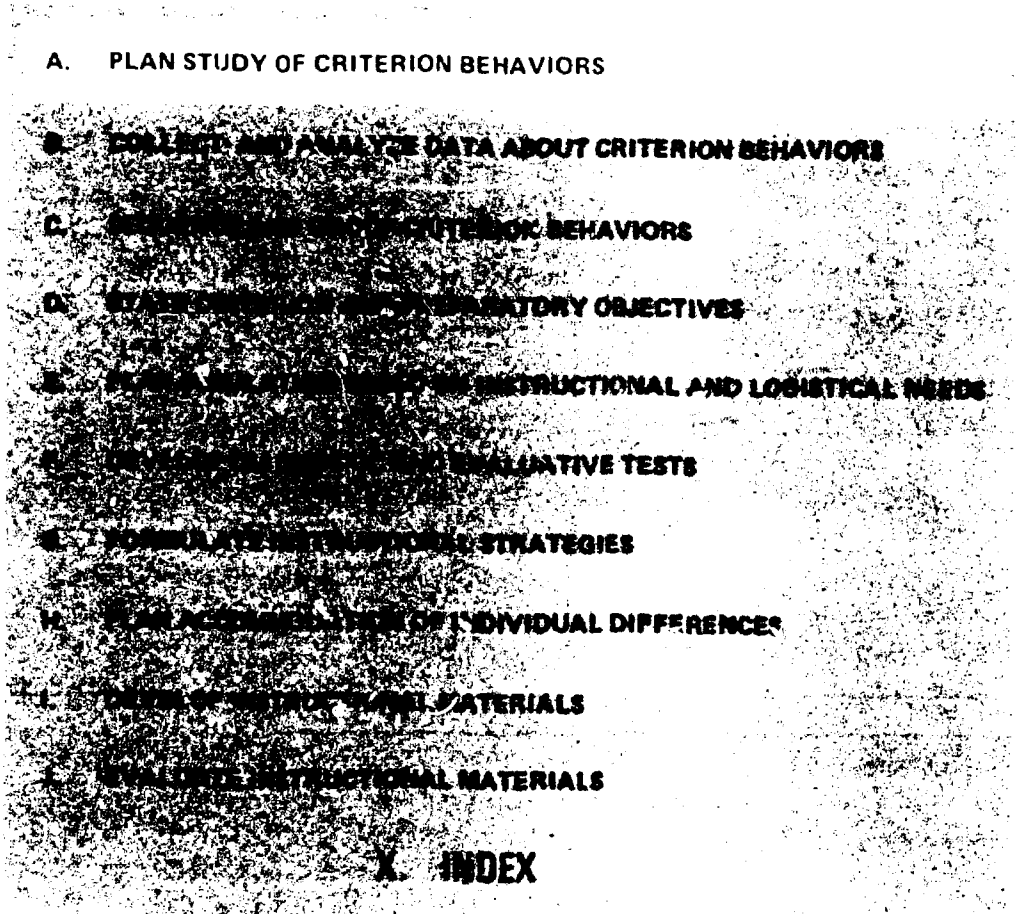
ABSTRACT

This document is the first in a series of 11 subvolumes of a handbook providing training for educational research and development personnel in the development of instructional materials. This subvolume deals with the task of developing a plan study of criterion behaviors. The document content is divided into the following five steps: (a) identify the type of criterion behavior to be taught and the type of target audience to which it will be taught; (b) identify methods for obtaining information necessary to describe and analyze criterion behavior; (c) select information sources needed to describe and analyze criterion behavior; (d) plan the sequence in which information about criterion behavior will be collected; and (e) develop (or plan to use existing) information-collection instruments and procedures. Various substeps are listed that describe the procedures for performing the steps. (PD)

AIR-20241-9/71-RP

A Technology For Developing Instructional Materials

3 HANDBOOK



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Published by:

AMERICAN INSTITUTES
FOR RESEARCH
Pittsburgh, Pennsylvania

VOLUMES IN THIS SERIES

1. USER'S MANUAL
2. ORIENTATION
3. HANDBOOK
   (eleven sub-volumes)
4. WORKBOOK
5. FINAL EXERCISES

FOREWORD

This is one of a series of eleven HANDBOOK sub-volumes which has been prepared to provide training for educational R&D personnel in the development of instructional materials.

The USER'S MANUAL, which accompanies the series, describes the role each volume is designed to play and the sequence recommended for its use in the training process. The user is, therefore, urged to read the instructions in the USER'S MANUAL before using this or any other separate volume.

ACKNOWLEDGMENTS

The materials in this volume were prepared under a contract from the U.S. Office of Education, Contract No. OEC-0-70-4776(520). Dr. George L. Gropper, Director of Instructional Media Studies, served as principal investigator.

U.S.O.E. sponsorship does not in any way imply official endorsement of the views expressed in this volume.

The author is indebted: to Dr. Robert Fitzpatrick for reviewing portions of the series of volumes and for informal discussions concerning several training issues; to Mrs. Zita Glasgow for the first and critical use of this volume; and, not least, to Miss Kathleen Gubala for her tireless preparation of the complex manuscript required by this HANDBOOK.

George L. Gropper
March 1973

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*No detail provided for this sub-step

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STEP A.1

A.1 Identify the type of criterion behavior to be taught and the type of target audience to which it will be taught.

A.1.1 Identify the type(s) of criterion behavior to be taught.

A.1.2 Identify the type of target audience to be taught.

STEP A.1

OVERVIEW

INPUT	ACTION	OUTPUT
Plans for curriculum or training program development	Identify type of criterion behavior type of target audience	Identification of types of criterion behavior and type of target audience

Sub-STEPS

			Identification
A.1.1	Development plans or comparable existing curriculum or training program (i)	Inspect for presence of characteristics indicating different types of criterion behavior (ii)	-KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR (iii)
A.1.2	Development plans (iv)	Review for characteristics identifying the type of target audience (v)	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL (vi)

STEP A.1

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A.1.1	-MATRIX: Types of criterion behavior . . . . 8 -Examples 9			
A.1.2	-MATRIX: Types of target audience 14			

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A characterization of the criterion behavior as involving:* *... a knowledge domain* *... performance* *... general cognitive skills* *... personal/social behavior*
WHAT YOU WILL WORK FROM	(1) Curriculum development plans or a comparable existing instructional program.
WHAT YOU WILL DO	(1) Identify the type(s) of criterion behavior involved.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.1.1

INPUT	ACTION	OUTPUT
Development plans or comparable existing curriculum or training program i	Inspect for presence of characteristics indicating different types of criterion behaviors ii	Identification of: -KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR iii

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Types of criterion behavior . . . . 8 -Examples of criterion behavior 9			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS

Sub- STEP A.1.1

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Development plans or comparable existing curriculum or training program — i	Inspect for presence of characteristics indicating different types of criterion behaviors — ii	Identification of: -KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR — iii

Characteristics of Criterion Behavior		*Identification of Criterion Behavior*
Requirement that learner exhibit knowledge of or about something — i.a	Identify type of criterion behavior — ii.a	KNOWLEDGE DOMAIN — iii.a
Requirement that learner do something, following procedures and resulting in an output — i.b	Identify type of criterion behavior — ii.b	PERFORMANCE — iii.b
Requirement that learner engage in behaviors applicable to a wide range of situations — i.c	Identify type of criterion behavior — ii.c	GENERAL COGNITIVE SKILLS — iii.c
Requirement that learner exhibit behavior that needs to be reinforced to be maintained — i.d	Identify type of criterion behavior — ii.d	PERSONAL/SOCIAL BEHAVIOR — iii.d

JOB PROCEDURES

	page
Distinguishing between four types of criterion behavior	8

A.1.1

IDENTIFICATION MATRIX

CRITERIA FOR IDENTIFYING FOUR TYPES OF CRITERION BEHAVIOR

CRITERIA	*Exhibits knowledge of or about something*	*Does something, following procedures and resulting in an attainment or production of an output*	*Exhibits an approach applicable to wide range of problems or situations*	*Engages in behavior that must be reinforced to be maintained (i.e., motivated)*
TYPES OF CRITERION BEHAVIOR	KNOWLEDGE DOMAIN	PERFORMANCE	GENERAL COGNITIVE SKILLS	PERSONAL/SOCIAL BEHAVIOR
SUBJECT MATTER (SCHOOL) EXAMPLES	-Defines concepts -Gives or points to an example of a concept -States principles -Describes or labels objects or events -Cites facts*	-Performing experiments -Solving problems -Reading, writing -Translating a language -Constructing or using equipment -Writing an essay*	-Using discovery procedures -Applying a problem-solving model -Perceptual/motor skills -Creating new solutions to problems or procedures	-Persisting at work -Paying attention -Setting goals -Working independently -Showing interest in work -Not disturbing others -Cooperating with others
JOB EXAMPLES	-*All of above may occur plus:* -States rules about job performance -Lists procedures to follow on job -Gives a rationale for alternative procedures	-Performs procedural tasks -Makes or repairs products -Operates or trouble-shoots equipment -Performs decision-making tasks -Performs service tasks	-*Same as above*	-Keeping peers superiors or subordinates informed -Adhering to regulations -Getting work done on time -Cooperating with others

*Facts cited in an essay would be evidence of "knowledge" acquired. The structuring and organization

A.1.1 EXAMPLES	KNOWLEDGE DOMAIN	PERFORMANCE
SUBJECT MATTER AREAS	-An English student stating rules of punctuation -A physics student identifying variables that need to be controlled in an experiment -A biology student classifying a frog -A math student describing properties of a quadratic equation -A history student listing the causes of the Civil War	-An English student punctuating a sentence -A physics student operationally controlling the variables in an experiment -A biology student dissecting a frog -A math student factoring a quadratic equation -A history student doing the research needed to identify the causes of the Civil War
JOBS	-A teacher describing a reinforcement schedule to maintain behavior -A librarian stating the rules for cataloguing books -A plant supervisor describing techniques for counseling subordinates	-A teacher implementing a reinforcement schedule that maintains behavior -A librarian actually cataloguing books -A plant supervisor actually counseling subordinates

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A characterization of the target audience for:* *... age/grade level* *... socio economic, ethnic, or social background* *... past achievement levels or deficits*
WHAT YOU WILL WORK FROM	(1) Curriculum development plans
WHAT YOU WILL DO	(1) Review plans in order to identify characteristics of the target audience which will influence the type(s) of instructional materials to be developed.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.1.2

INPUT	ACTION	OUTPUT
Development plans iv	Review for characteristics identifying the type of audience v	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL vi

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Types of target audience 14			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS

Sub-STEP A.1.2

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Development plans (iv)	Review for characteristics identifying the type of target audience (v)	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL (vi)

Characteristics of Target Audiences		*Identification of Type of Target Audiences*
-Age -Grade -Work status (iv.a)	Identify AGE or GRADE LEVEL (v.a)	-Preschoolers -Primary/secondary -High school -College -Adult (vi.a)
-Parental income -Residence patterns -Parental occupation (iv.b)	Identify SOCIOECONOMIC STATUS (v.b)	-Disadvantaged -Working class -Middle class -Urban/rural (vi.b)
-Color -Languages used (iv.c)	Identify ETHNIC/RACIAL BACKGROUND (v.c)	-Blacks -Spanish-speaking (vi.c)
-Physical handicaps -Emotional handicaps -Ability deviations (iv.d)	Identify PHYSICAL/PSYCHOLOGICAL DEVIATIONS (v.d)	-Blind -Deaf -Mentally retarded -Emotionally disturbed -Gifted (vi.d)
-School performance -School completion -Record of type of training received -Interest patterns -Test scores (iv.e)	Identify PAST EDUCATIONAL ACHIEVEMENT (v.e)	-Over/under achievers -Dropouts -School graduates -Grades received -Nature of training received (vi.e)

JOB PROCEDURES

A.1.2 FIVE CHARACTERISTICS TO BE USED IN IDENTIFYING TYPE OF TARGET AUDIENCE

IDENTIFICATION MATRIX

CHARACTERISTICS	AGE OR GRADE LEVEL	SOCIOECONOMIC STATUS	ETHNIC/RACIAL BACKGROUND	PHYSICAL/ PSYCHOLOGICAL DEVIATIONS	PAST EDUCATIONAL ACHIEVEMENT
TYPES OF TARGET AUDIENCE	-Preschoolers -Primary/secondary students -High school students -College students -Adults	-Disadvantaged -Working class -Middle class and up -Urban -Rural	-Bilingual groups -Colored groups -Religious groups -Nationality groups -Minority groups	-Blind -Deaf -Mentally retarded -Gifted -Emotionally disturbed -Problems of malnutrition	-School graduates -Dropouts -Grades received -Type of training received -Over and under-achievers

STEP A.2

PAGE INDEX

	CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
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A.2.2		-MATRIX: Selecting description techniques . . . 32, 34, 35 -Examples 33		

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A determination of whether or not there is an identification of the criterion behavior available which can serve as a model for the instructional program to be developed.*
WHAT YOU WILL WORK FROM	(1) Available information (in books, or from informants) about the criterion behavior.
WHAT YOU WILL DO	(1) Review information to determine whether there is an available model for what's involved in the criterion behavior; (2) Review information to determine whether the available model is acceptable.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.2.1

INPUT	ACTION	OUTPUT
Available information about criterion behavior in subject matter areas or in jobs i	Review information for characteristics indicating model availability and acceptability ii	Identification of model availability and acceptability iii

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
MATRIX: Model availability . . 24 MATRIX: Model acceptability . 25 MATRIX: Model availability and acceptability . 26, 27			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			

Sub-STEP A.2.1

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Available information about criterion behavior in subject matter areas or in jobs (i)	Review information for characteristics indicating model availability and acceptability (ii)	Identification of model availability and acceptability (ii)

I

		Identification
Model Specifications for Criterion Behavior: -Complete -Systematic -Result in successful outcome -Agreed on (i.a)	Review information to see if model meets these criteria (ii.a)	Model is ACCEPTABLE (iii.)
Model Specifications for Criterion Behavior: -Incomplete -Non-systematic -Do not result in successful outcome -Not agreed on (i.b)	Review information to see if model meets these criteria (ii.b)	Model is NOT ACCEPTABL (iii.)

II

Characteristics of Criterion Behavior: -Routine -Non-complex -Man/object -Overt (i.a)	Review information for possession by terminal behavior of these characteristics (ii.a)	Model more likely to be AVAILABLE and ACCEPTABLE (iii.)
Characteristics of Criterion Behavior: -Innovative -Complex -Man/man -Covert (i.b)	Review information for possession by terminal behavior of these characteristics (ii.b)	Model more likely to be UNAVAILABLE or UNACCEPTABLE (iii.)

JOB PROCEDURES

A.2.1

CRITERIA FOR DETERMINING THE AVAILABILITY OF A MODEL OF CRITERION BEHAVIOR

IDENTIFICATION MATRIX

CRITERIA	*-Criterion behavior is being exhibited* *-There are prescriptions for the criterion behavior*	*-Criterion behavior is not being exhibited* *-There are not prescriptions for the criterion behavior*
MODEL AVAILABILITY	MODEL IS AVAILABLE	MODEL IS NOT AVAILABLE
SUBJECT MATTER (SCHOOL) EXAMPLES	e.g., performing laboratory experiments e.g., writing book reports e.g., listing the advantages and disadvantages of a market economy	e.g., developing creative solutions to problems e.g., cooperating with fellow students on a group project
JOB EXAMPLES	e.g., the expert lathe operator exhibits all the required steps in using a lathe e.g., the expert accountant exhibits all the required steps in balancing figures in a ledger	e.g., new jobs not yet being performed

A.2.1

CRITERIA FOR DETERMINING THE ACCEPTABILITY OF A MODEL FOR CRITERION BEHAVIOR

IDENTIFICATION MATRIX

CRITERIA	*Model Specifications for Criterion Behavior:* *(1) are complete, comprehensive* *(2) are systematic* *(3) result in a successful outcome* *(4) are agreed on*	*Model Specifications for Criterion Behavior:* *(1) are not complete, comprehensive* *(2) are not systematic* *(3) do not result in a successful outcome* *(4) are not agreed on*
MODEL ACCEPTABILITY	MODEL IS ACCEPTABLE *when all four specifications are met*	MODEL IS NOT ACCEPTABLE *when any of the specifications are not met*
SUBJECT MATTER (SCHOOL) EXAMPLES	E.g., doing long division *The behaviors for doing long division are:* -Completely known -Fixed and systematic -Lead to a correct answer -Are agreed on by experts E.g., wiring lightbulbs and a battery in series -All four criteria are met	E.g., exhibiting evidence of "understanding" Ohm's Law *-There is agreement as to the content of Ohm's Law* *-There is not agreement as to how "understanding" should be expressed* *-Solving for an unknown* *-Writing the equation* *-Verbally describing the relations between the variables in the equation*
JOB EXAMPLES	E.g., switchboard operator handling incoming and outgoing calls *The behaviors are:* -Completely identified -Systematic -Lead to correct connections -Agreed to by experts E.g., teller processing deposit slips *The behaviors tend to be:* -Comprehensive -Systematic -Successful -Agreed to	E.g., teacher management of classroom (non-learning) behavior (as practiced by most teachers): *The models tend to be:* -Non-systematic -Unsuccessful E.g., sales behavior *The behaviors tend:* -Not uniformly to lead to success -Not to be agreed on -Not to be systematic

A.2.1

CHARACTERISTICS OF CRITERION BEHAVIOR DETERMINING THE LIKELIHOOD OF ITS MODEL BEING AVAILABLE AND ACCEPTABLE*

IDENTIFICATION MATRIX

CHARACTERISTICS	*When criterion behavior is:* *-Routine, fixed set of procedures* *-Non-complex* *-Involves man/object relations* *-Overt*	*When criterion behavior is:* *-Innovative, variable procedures* *-Complex* *-Involves man/man relations* *-Covert*
MODEL AVAILABILITY AND ACCEPTABILITY	MODEL IS MORE LIKELY TO BE AVAILABLE AND ACCEPTABLE	MODEL IS LESS LIKELY TO BE AVAILABLE AND ACCEPTABLE
EXAMPLES	When criterion behavior is (one or more of the following): -Routine, involving fixed set of procedures e.g., doing long division e.g., typing -Non-complex e.g., punctuating a sentence e.g., mixing paint colors -Involves man/object relations e.g., using a lever e.g., operating equipment -Overt behavior e.g., writing	When criterion behavior is (one or more of the following): -Creative, innovative, involving alternative set of procedures e.g., painting an abstract e.g., formulating a theory -Complex e.g., practicing psychiatry e.g., writing an essay -Involves man/man relations e.g., managing classroom behavior e.g., cooperating in a group project -Covert behaviors e.g., reading

**Mixtures of these characteristics are possible, sometimes resulting in available and acceptable models and sometimes not.*

A.2.1 TYPES OF CRITERION BEHAVIOR AND THE LIKELIHOOD OF THEIR HAVING AVAILABLE AND

IDENTIFICATION MATRIX

TYPES OF CRITERION BEHAVIOR	KNOWLEDGE DOMAIN	PERFORMANCE	GENERAL COGNITIVE SKILLS	PERSONAL/SOCIAL BEHAVIOR
MORE LIKELY to have available and acceptable model	✓ *For content to be learned:* e.g., which concepts, principles, facts, etc. should be learned	✓ e.g., dissecting a frog e.g., factoring a quadratic equation e.g., operating equipment		
LESS LIKELY to have available and acceptable model	✓ *For the form of the evidence that learning has taken place* e.g., multiple choice vs. constructed answers e.g., defining a term vs. citing an example e.g., stating a rule vs. applying it		✓ e.g., taking a problem-solving approach to varied, new situations e.g., using a discovery method for learning	✓ e.g., cooperating with other students e.g., setting goals e.g., supervisory or managerial behavior

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Plans for collecting information about the criterion behavior -- involving the use of:* ... *verbal reports* ... *observation* ... *theory generation or judgment*
WHAT YOU WILL WORK FROM	(1) The decisions as to whether or not a model of the criterion behavior is both available and acceptable as a basis for the development of an instructional program.
WHAT YOU WILL DO	(1) Make alternative plans for collecting information about the criterion behavior -- depending on model availability and/or acceptability.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.2.2

INPUT	ACTION	OUTPUT
Decision about model availability and acceptability for criterion behavior to be taught i	Make plans for methods to use in collecting information about criterion behavior ii	Identification of information-gathering techniques to be used: VERBAL REPORT OBSERVATION THEORY GENERATION JUDGMENT iii

Job Aid Contents

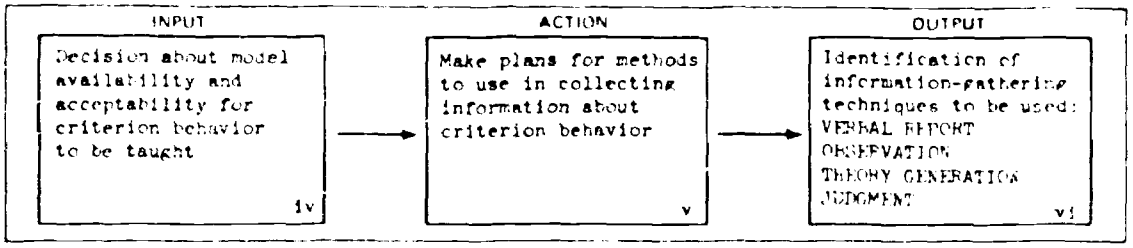
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	MATRIX: Selecting description techniques . 32, 34, 35 Examples 33		

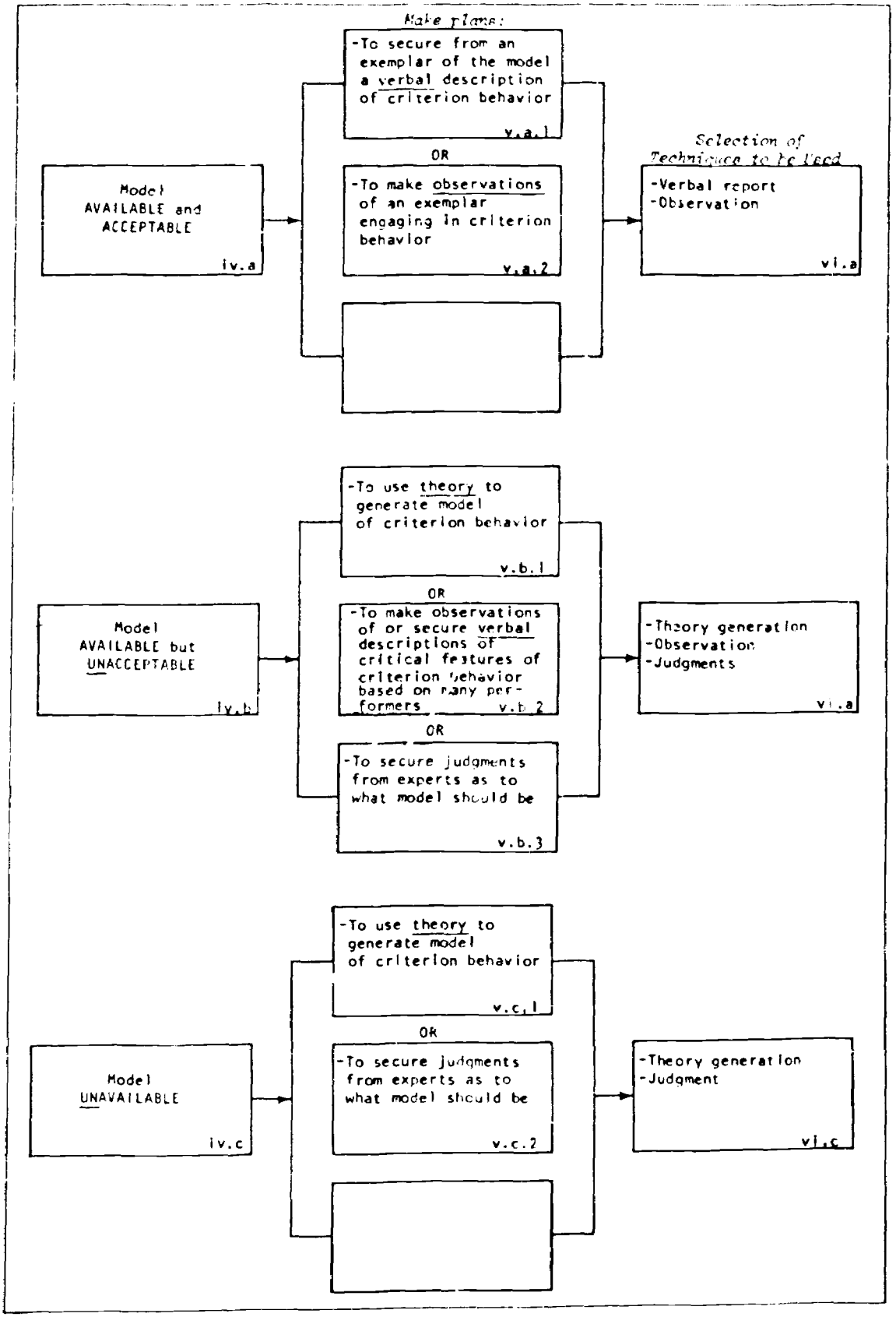
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of model availability and acceptability	A.2.1			

Sub-STEP A.2.2

JOB DIAGRAM





JOB PROCEDURES

CHOICE OF INFORMATION-GATHERING TECHNIQUES BASED ON MODEL AVAILABILITY AND ACCEPTABILITY

DECISION MATRIX

CONDITIONS	*Model AVAILABLE and ACCEPTABLE* *-Comprehensive* *-Systematic* *-Successful* *-Agreed to*	*Model AVAILABLE but UNACCEPTABLE* *-Incomplete, or* *-Nonsystematic, or* *-Unsuccessful, or* *-Not agreed to*	*Model UNAVAILABLE*
ACTION TO TAKE	OBTAIN DESCRIPTION OF MODEL	FORMULATE AND DESCRIBE MODEL	FORMULATE AND DESCRIBE MODEL
SOURCE OF MODEL DESCRIPTION	(1) The total performance of an expert is described	(1) Critical elements in the performance of many people are described resulting in a total description of a model (2) Theory is used to generate a description of a model* (3) Judgments of experts are used to create a model	(1) Theory is used to generate a description of a model* (2) Judgments of experts are used to create a model
SPECIFIC TECHNIQUES TO USE	(1a) Have the expert verbally describe his own total performance (1b) Have an independent observer observe and verbally describe the total performance (1c) Read a description in appropriate reference sources	(1) Have the performer, his subordinate, or his superior report on critical features of just part of the total performance (a) From memory (b) From immediate observation (2) Use appropriate theory to generate behaviors to be used (3) Use judgments to obtain agreement to what the model should be	(1) Use appropriate theory to generate behaviors to be used (2) Use judgments to obtain agreement to what the model should be

**Theory is preferred to judgments whenever there is an appropriate one available.*

A.2.2

DETERMINING HOW TO OBTAIN INFORMATION NECESSARY TO DESCRIBE OR GENERATE A MODEL

DECISION MATRIX

ACTION TO TAKE	-Using the behavior of an expert as the model -Have him verbally describe his own behavior -Observe and describe his behavior	-Use theory to generate a model -Use expert judgment to create a model -Describe critical elements in performance of many performers	-Generate from theory a statement of criterion behavior -Secure judgments from experts as to what criterion behavior should be
CONDITIONS	Model AVAILABLE and ACCEPTABLE	Model AVAILABLE but UNACCEPTABLE	Model UNAVAILABLE
SUBJECT MATTER (SCHOOL) EXAMPLES	E.g., have a mathematician describe his operations in solving for an unknown in an equation E.g., Have a chemist demonstrate how he performs an experiment	-Secure judgments from experts as to content of criterion behavior and from education specialists what form behavior should take: E.g., geography: how the student should identify relationships between raw materials' availability and growth of urban centers E.g., music: how the student should identify musical styles	E.g., secure judgments from education specialists as to the behaviors involved in the "discovery" process E.g., secure judgments from development specialists as to behaviors involved in "cooperation"
JOB EXAMPLES	E.g., have an expert woodworker describe all the steps he follows in preparing lumber for use E.g., have an expert secretary demonstrate how she files correspondence	-Have many job holders or their supervisors describe single behaviors that proved critical in some portion of the task of: E.g., troubleshooting malfunctions in electronic equipment E.g., planning manpower strategies	E.g., generate from behavior theory a statement of teacher behaviors to be used in managing classroom problem behavior -Use reinforcement to strengthen adaptive behavior -Use extinction to weaken non-adaptive behavior

A.2.2

MORE SPECIFIC GUIDELINES WHEN A MODEL IS AVAILABLE BUT UNACCEPTABLE

DECISION MATRIX

CONDITIONS	*Model is INCOMPLETE or NOT SYSTEMATIC*	*Model results in UNSUCCESSFUL OUTCOMES*	*Model is NOT AGREED TO*
Model is *COMPLETE and SYSTEMATIC*		Use theory to develop model E.g., teacher lecturing behavior may be completely described, but the model does not lead to success; use instructional technology model to generate model of lecturing behavior	Use judgment of experts to develop model E.g., biologists agree on content, but not on form of criterion behavior: Secure judgments of education specialists on form criterion behavior should take
Model results in *SUCCESSFUL OUTCOME*	Develop model by describing critical elements in performance of many performers E.g., troubleshooting electronics equipment: Performers of this job succeed, but the description of their performance is incomplete; the description of their collective experience leads to a complete model		Develop model by describing critical elements in performance of many performers Use judgment of experts to develop model
Model is *AGREED TO*	Develop model by describing critical elements in performance of many performers E.g., the major procedures in the development of curricula are agreed to; the model is incomplete, however: Secure from many technologists descriptions of critical elements in their performance	Use theory to develop model E.g., counselling procedures may be agreed on, but they are unsuccessful; use theory to generate effective model	

A.2.2

INFORMATION-GATHERING TECHNIQUES LIKELY TO BE USED FOR DIFFERENT TYPES OF CRITERION BEHAVIOR

DECISION MATRIX

TYPE OF CRITERION BEHAVIOR	*KNOWLEDGE DOMAIN*	*PERFORMANCE*	*GENERAL COGNITIVE SKILLS*	*PERSONAL/SOCIAL BEHAVIOR*
SUBJECT MATTER (SCHOOL)	-Judgments about: --Subject matter content --Form of criterion behavior	-Observation -Verbal report of a single performer -Theory generation of model	-Theory generation of a model -Judgments about what model should be	-Theory generation of a model -Judgments about what model should be -Descriptions of critical elements in many performances
JOBS	-Judgments about: --Subject matter content --Form of criterion behavior	-Observation -Verbal report of a single performer -Descriptions of critical elements in many performances -Theory generation of model	-Theory generation of a model -Judgments about what model should be	-Theory generation of a model -Judgments about what model should be -Descriptions of critical elements in many performances

35/36

STEP A.2

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.2.1	-Availability and acceptability of model of criterion behavior			
A.2.2		-Selection of methods for obtaining a description of criterion behavior		

STEP A.3

A.3 Select information sources needed to describe and analyze criterion behavior.

A.3.1 Identify information sources appropriate to the type of criterion behavior to be taught and to the types of information-gathering techniques selected.

A.3.2 Select from identified sources those who are appropriate to the target audience and to the types of analysis to be performed.

* A.3.3 Have experts selected for the above tasks review the adequacy of the earlier decision about model availability and acceptability. If necessary, modify plans for using information-collection techniques.

*No detail provided for this sub-step

STEP A.3

OVERVIEW

INPUT	ACTION	OUTPUT
Identification of: -Criterion behavior -Information-gathering techniques -Target audience	Select appropriate information sources	Selection of information sources appropriate to types of description and analysis to be made

Sub-STEPS

A.3.1	Decisions about types of techniques to use to describe criterion behavior — i	Select appropriate information sources — ii	Identification of types of information sources appropriate to types of criterion behavior and techniques to be used to describe them — iii
A.3.2	Identified characteristics of target audience — iv	Select information sources appropriate to target audience and to analysis needs — v	Identification of types of information sources appropriate to types of target audience and to types of analysis to be performed — vi
A.3.3	Decision about model availability and acceptability — vii	Solicit assessment by experts chosen as to model acceptability. Revise decision where necessary — viii	Final decision about model acceptability — ix

STEP A.3

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A.3.1		-MATRIX: Selecting source of information appropriate to technique to be used 47		
A.3.2		-MATRIX: Selecting source of information appropriate to target audience . . . 52 -Examples . . . 53		
A.3.3		*NO DETAIL PROVIDED FOR THIS SUB-STEP*		

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*An identification of information sources appropriate to the criterion behavior to be analyzed and to the information collection techniques to be used.*
WHAT YOU WILL WORK FROM	(1) Decisions about types of information collection techniques to use.
WHAT YOU WILL DO	(1) Select appropriate informants or sources of information.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.3.1

INPUT	ACTION	OUTPUT
Decisions about types of techniques to use to describe criterion behavior i	Select appropriate information sources ii	Identification of types of information sources appropriate to types of criterion behavior and techniques to be used to describe them iii

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	-MATRIX: Selecting source of information appropriate to techniques to be used 47		

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Selection of information-gathering techniques	A.2.2			

Sub-STEP A.3.1

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Decisions about types of techniques to use to describe criterion behavior — i	Select appropriate information sources — ii	Identification of types of information sources appropriate to types of criterion behavior and techniques to be used to describe them — iii

Selection

Plans to describe performance of expert — i.a	Identify appropriate expert performer — ii.a	-SUBJECT MATTER EXPERT -JOB EXPERT — iii.a
Plans to describe the critical elements in the performance of many job holders — i.b	Identify appropriate job holders — ii.b	-JOB HOLDERS — iii.b
Plans to solicit judgments of experts as to what criterion behavior should be — i.c	Identify experts appropriate to type of criterion behavior — ii.c	-Knowledge domain -SUBJECT MATTER EXPERT -JOB EXPERTS -General cognitive skills -COGNITION EXPERT -DEVELOPMENT EXPERT -Performance -TRAINING SPECIALIST — iii.c
Plans to use theory to generate description of model of criterion behavior — i.d	Identify experts appropriate to type of criterion behavior — ii.d	-General cognitive skills -COGNITION EXPERT -DEVELOPMENT EXPERT -Personal/social behavior -DEVELOPMENT EXPERT -INDUSTRIAL PSYCHOLOGIST -Performance -BEHAVIOR THEORIST — iii.d

JOB PROCEDURES

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Selecting sources of information appropriate to types of criterion behavior and information-collection techniques	47

A.3.1

DECISION MATRIX

SELECTING SOURCES OF INFORMATION APPROPRIATE TO: TYPES OF CRITERION BEHAVIOR AND TYPES OF INFORMATION-GATHERING TECHNIQUES

SUBJECT MATTER				
	DESCRIBE EXPERT PERFORMANCE	*DESCRIBE CRITICAL ELEMENTS*	*USE JUDGMENTS*	*USE THEORY*
KNOWLEDGE DOMAIN			-Subject matter expert (content) -Education specialist (form of criterion behavior)	
PERFORMANCE	-Subject matter expert			
GENERAL COGNITIVE SKILLS			-Cognition expert -Developmental expert	-Cognition expert -Developmental expert
PERSONAL/SOCIAL BEHAVIOR			-Developmental expert	-Developmental expert

JOBS				
	DESCRIBE EXPERT PERFORMANCE	*DESCRIBE CRITICAL ELEMENTS*	*USE JUDGMENTS*	*USE THEORY*
KNOWLEDGE DOMAIN			-Job experts (content) -Training specialists (form of criterion behavior)	
PERFORMANCE	-Job expert	-Many job holders or their superiors	-Training specialists	-Industrial psychologist -Behavior theorist
PERSONAL/SOCIAL BEHAVIOR			-Industrial psychologist	-Industrial psychologist

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Identification of information sources appropriate to (expert about) the type of audience to be taught and to the types of analysis of the criterion behavior to be performed.*
WHAT YOU WILL WORK FROM	(1) Identification of characteristics of the target audience.
WHAT YOU WILL DO	(1) Select sources of information appropriate to the target audience and to the types of analyses to be performed.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.3.2

INPUT	ACTION	OUTPUT
Identified characteristics of target audience i	Select information sources appropriate to target audience and to analysis needs ii	Identification of types of information sources appropriate to types of target audience and to types of analysis to be performed iii

Job Aid Contents

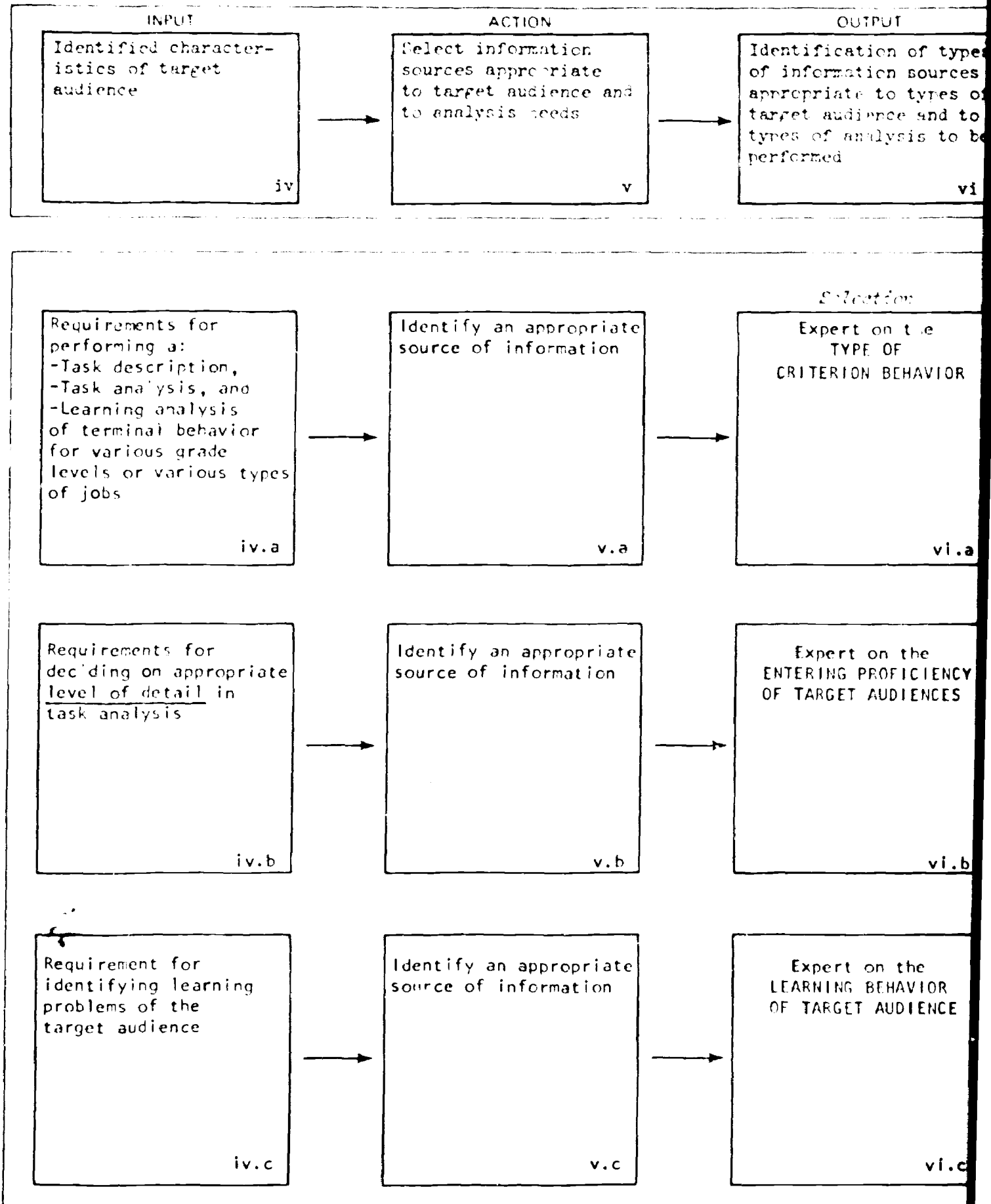
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	-MATRIX: Selecting source of information appropriate to target audience . . . . 52 -Examples 53		

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of types of target audience	A.1.2			

Sub-STEP A.3.2

JOB DIAGRAM



JOB PROCEDURES

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Sources of information which are appropriate to the target audience and to types of analysis to be performed	52

A.3.2

SELECTION OF SOURCES OF INFORMATION APPROPRIATE TO TARGET AUDIENCE AND TO TYPES OF ANALYSIS OF CRITERION BEHAVIOR

DECISION MATRIX

ANALYSIS NEEDS	-Task description of -Task analysis of -Learning analysis of Criterion Behavior	-Decisions about appropriate level of detail in task analysis	-Decisions about learning outcome of target audience
GRADE LEVEL:	-College level subject matter expert	-Subject matter expert appropriate to grade, e.g., third grade and upper level -Developmental expert	-Subject matter expert appropriate to grade, e.g., third grade and upper level -Developmental expert
SCHOOL: SPECIAL TARGET AUDIENCE		-Expert on target audience, e.g., expert on the deaf or the disadvantaged	-Expert on target audience, e.g., expert on the deaf or the disadvantaged
JOBS:	-Job expert	-Job expert -Training expert	-Job expert -Training expert

EXAMPLES			
ANALYSIS NEEDS	-Task description of -Task analysis of -Learning analysis of Criterion Behavior	-Descriptions about appropriate level of detail in task analysis	-Decisions about learning problems of target audience
SCHOOL: GRADE LEVEL	10th Grade Biology -Use college teacher of biology to identify appropriate content and to participate in its analysis	10th Grade Biology -Use 10th grade biology teacher to assist in identification of typical entering levels of proficiency (skills already possessed)	10th Grade Biology -Use 10th grade biology teacher to identify typical difficulties 10th graders have with content to be learned
SCHOOL: SPECIAL TARGET AUDIENCES	Remedial Reading for the Disadvantaged -Reading expert	Remedial Reading for the Disadvantaged -Expert to identify the entering proficiency of the disadvantaged group	Remedial Reading for the Disadvantaged -Expert to identify the reading problems of the disadvantaged group
JOBS:	Computer Programming -Expert on computer programming to provide information for the description and analysis of the tasks in this performance	Computer Programming -Training expert on computer programming to identify entering proficiency of typical candidates for training	Computer Programming -Training expert to identify typical problems trainees have in learning computer programming

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A final decision about the availability and acceptability about a model of the criterion behavior.*
WHAT YOU WILL WORK FROM	(1) Previous decisions about model availability and acceptability.
WHAT YOU WILL DO	(1) Solicit assessment from the selected information sources (experts) about the decision made about model availability and acceptability. (2) Revise decision when necessary.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.3.3

INPUT	ACTION	OUTPUT
Decision about model availability and acceptability vii	Solicit assessment by experts chosen as to model acceptability. Revise decision where necessary viii	Final decision about model acceptability ix

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	NO DETAIL PROVIDED FOR THIS SUB-STEP		

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS

STEP A.3

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.3.1		-Selection of information source appropriate to information collection technique		
A.3.2		-Selection of information source appropriate to audience and type of analysis		
A.3.3		-Review by expert of assessment of model availability and acceptability		

STEP A.4

≠ A.4 Plan the sequence in which information about criterion behavior will be collected.

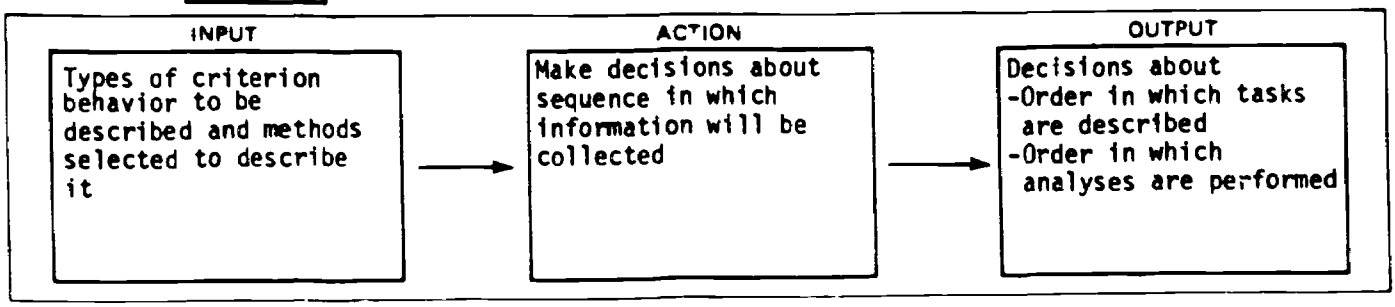
A.4.1 Decide on the sequence in which the tasks and steps involved in criterion behavior will be described and recorded.

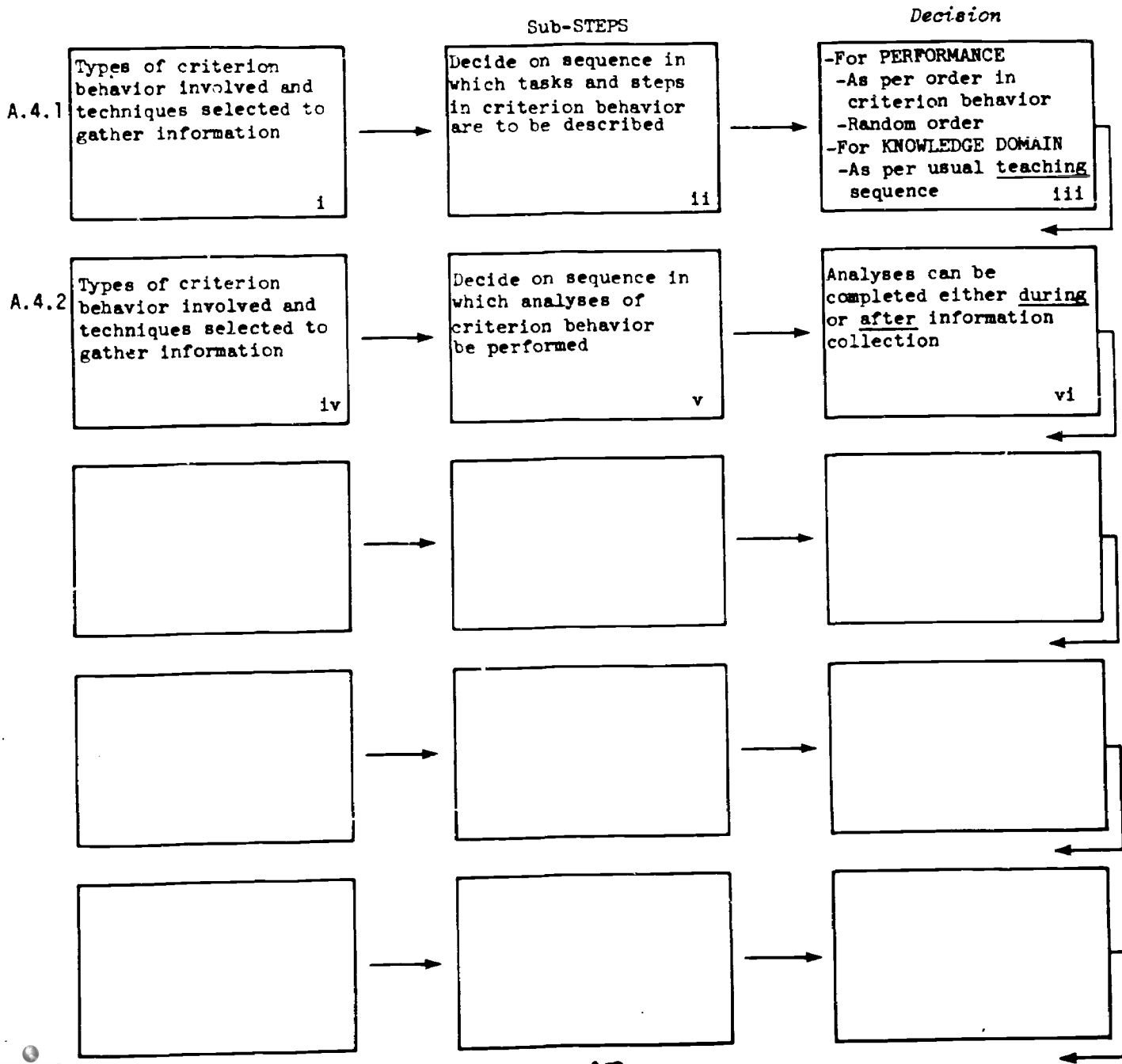
A.4.2 Decide on the sequence in which the various analyses of criterion behavior will be performed.

≠ *Starting with this step, A.4., only two types of criterion behavior, PERFORMANCE and KNOWLEDGE DOMAIN, will be treated. There will be no further treatment of general cognitive skills and personal/social behavior. The treatment of "performance" in subsequent sections most closely approximates that required by these two other types of criterion behavior. Subsequent sections will also provide no further treatment of theory-generated descriptions of models of criterion behavior.*

STEP A.4

OVERVIEW





STEP A.4

PAGE INDEX

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*A decision about the order in which to collect information about the various parts of the criterion behavior.*
WHAT YOU WILL WORK FROM	(1) Decisions about types of information to collect and how it will be collected.
WHAT YOU WILL DO	(1) Decide on the sequence in which the parts of the criterion behavior (e.g., tasks, steps, or substeps) will be collected.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.4.1

INPUT	ACTION	OUTPUT
Types of criterion behavior involved and techniques selected to gather information i	Decide on sequence in which tasks and steps in criterion behavior are to be described ii	-For PERFORMANCE -As per order in criterion behavior -Random order -For KNOWLEDGE DOMAIN -As per usual teaching sequence iii

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	-MATRIX: Selecting sequence for describing criterion behavior 67		

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			
Selection of information-collecting techniques	A.2.2			

Sub-STEP A.4.1

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Types of criterion behavior involved and techniques selected to gather information i	Decide on sequence in which tasks and steps in criterion behavior are to be described ii	-For PERFORMANCE -As per order in criterion behavior -Random order -For KNOWLEDGE DOMAIN -As per usual teachin sequence ii

Decision

Plans to describe PERFORMANCE of an EXPERT i.a	Decide on the order in which the tasks and steps of performance will be described ii.a	Tasks and steps within tasks will be describe in the SAME ORDER AS THEY OCCUR in criterio behavior iii.
Plans to describe CRITICAL ELEMENTS in PERFORMANCE of many job holders i.b	Decide on the order in which the critical elements of performance will be described ii.b	Critical elements will be described: -IN RANDOM ORDER (and sequenced later) -In the order of the MAJOR TASKS or MAJOR STEPS of criterion behavior iii.
Plans to use JUDGMENTS of experts in describ-ing KNOWLEDGE DOMAIN i.c	Decide on the order in which the contents of knowledge domain will be described ii.c	Contents of knowledge domain will be described IN ORDER IN WHICH THEY ARE USUALLY TAUGHT iii.

JOB PROCEDURES

A.4.1 DECISION ON SEQUENCE IN WHICH TO DESCRIBE TASKS IN CRITERION BEHAVIOR BASED ON TYPE OF CRITERION BEHAVIOR AND TECHNIQUE USED TO DESCRIBE IT

DECISION MATRIX

CONDITIONS	*Plans to describe PERFORMANCE of an EXPERT*	*Plans to describe CRITICAL ELEMENTS in PERFORMANCE of many job holders*	*Plans to use JUDGMENTS of experts in describing KNOWLEDGE DOMAIN*
ACTION TO TAKE	Describe tasks and steps within tasks in the same order in which they are performed.	Collect descriptions of critical elements: -In random order (to be sequenced during later analysis) -In the order of the major tasks or the major steps of the performance.	Collect descriptions of tasks in the order in which they are currently or typically taught.
EXAMPLES	e.g., doing multiplication Describe the steps in the order in which the mathematician solves a multiplication problem.	e.g., driving behavior Collect descriptions of critical elements in any portion of driving performance from many drivers. (Each informant decides which tasks or steps to describe).	e.g., answering test questions on principles about "light" Describe the concepts and principles relevant to the topic "light" in the order in which a physicist usually teaches them (or as he now judges to be a suitable order).
	e.g., threading a film projector Describe the steps in the order in which the projectionist threads the projector.	e.g., driving behavior Collect descriptions of critical elements in the task of "passing other cars," then other tasks. (Each informant is directed to one or more particular tasks and in a particular order when it is known)	e.g., answering test questions on rules about driving Describe the rules in the groupings and order in which they are currently being taught.

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Decisions about which analyses will be performed <u>while</u> information about the criterion behavior is being collected and which analyses will be performed <u>after</u> it is collected.*
WHAT YOU WILL WORK FROM	(1) Decisions about how information about criterion behavior will be collected.
WHAT YOU WILL DO	(1) Decide on the sequence (timing) in which analyses of the criterion behavior will be performed.
FORMS YOU WILL USE	

DESCRIPTION OF Sub STEP	A.4.2

INPUT	ACTION	OUTPUT
Type of criterion behavior involved; techniques selected to gather information iv	Decide on sequence in which analyses of criterion behavior will be performed v	Analyses can be completed either during or after information collection vi

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	-MATRIX: Selecting sequence for performing analyses of criterion behavior 72		

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			
Selection of information-collecting techniques	A.2.2			

Sub STEP A.4.2

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Types of criterion behavior involved and techniques selected to gather information iv	Decide on sequence in which analyses of criterion behavior will be performed v	Analyses can be completed either during or after information collection vi
Plans to describe PERFORMANCE of an EXPERT iv.a	Decide on the order in which analyses of performance will be made v.a	DURING: -Task description and analysis -Learning analysis AFTER: -More detailed analysis -Analysis of learning problems vi.a
Plans to describe CRITICAL ELEMENTS in PERFORMANCE of many job holders iv.b	Decide on the order in which analyses of critical elements will be made v.b	DURING: -Task description and analysis AFTER: -Learning analysis -Analysis of learning problems -More detailed analysis vi.b
Plans to use JUDGMENTS of experts in describing KNOWLEDGE DOMAIN iv.c	Decide on the order in which analyses of knowledge domain will be described v.c	DURING: -Task description and analysis -Learning analysis AFTER: -More detailed analysis -Analysis of learning problems vi.c

Decision

JOB PROCEDURES

	page
Determining the sequence in which analyses of criterion behavior will be performed	72

A.4.2 DECISION ON THE ORDER IN WHICH ANALYSES WILL BE PERFORMED BASED ON TYPE OF CRITERION BEHAVIOR AND TYPE OF INFORMATION COLLECTION TECHNIQU

DECISION MATRIX

CONDITIONS	*Plans to describe PERFORMANCE of an EXPERT*	*Plans to describe CRITICAL ELEMENTS in PERFORMANCE of many job holders*	*Plans to use JUDGMENTS of experts in describing KNOWLEDGE DOMAIN*
ACTION TO TAKE	Perform DURING information collection: -Task description -Task analysis -Learning analysis of subject matter Perform AFTER information collection: -More detailed task analysis -Analysis of learning problems of target audience	Perform DURING information collection: -Task description -Task analysis Perform AFTER information collection: -More detailed task analysis -Analysis of learning problems of target audience -Learning analysis of subject matter	Perform DURING information collection: -Task description -Task analysis -Learning analysis of subject matter Perform AFTER information collection: -More detailed task analysis -Analysis of learning problems of target audience

STEP A.4

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.4.1		-Selection of sequence in which tasks in criterion behavior will be described		
A.4.2		-Selection of sequence in which analyses of criterion behavior will be performed		

STEP A.5

A.5 Develop (or plan to use existing) information-collecting instruments and procedures.

A.5.1 Develop forms and procedures for obtaining and recording information needed to describe and analyze criterion behavior.

OR

A.5.2(a) Select from available forms and procedures recommended when performance is to be described either through observation of an expert or through verbal report by an expert.

OR

A.5.2(b) Select from available forms and procedures recommended when knowledge domain is to be described through judgments of an expert.

OR

A.5.2(c) Select from available forms and procedures recommended when performance is to be described through reports of critical elements by many job holders (or those associated with them).

A.5.3 Try out and revise information-collection instruments and procedures.

STEP A.5

OVERVIEW

INPUT	ACTION	OUTPUT
Identification of type of terminal performance and selection of required information-collection technique	Select from available forms those appropriate to required type of information-collection technique	Selection of FORMS

Sub-STEPS

A.5.1	Need to obtain, store, and process information about criterion behavior (i)	Develop forms and procedures that meet as many of the information-collecting requirements as possible (ii)	Forms and procedures which meet multiple information-collecting needs (iii)
		OR	
A.5.2 (a)	Plans to describe and analyze PERFORMANCE of an EXPERT (iv)	Select appropriate forms for recording observation of performance or to obtain and record description of performance (v)	Selection of forms for describing performance at an appropriate level of detail and for analyzing performance (vi)
		OR	
A.5.2 (b)	Plans to describe and analyze criterion behavior in KNOWLEDGE DOMAIN based on JUDGMENTS of an EXPERT (iv)	Select appropriate forms for obtaining and recording information about criterion behavior (v)	Selection of forms for describing and analyzing criterion behavior at appropriate level of detail (vi)
		OR	
A.5.2 (c)	Plans to observe and/or to obtain description of CRITICAL ELEMENTS in PERFORMANCE of MANY JOB HOLDERS (iv)	Select appropriate forms (v)	Selection of forms for describing performance at appropriate levels of detail (vi)
A.5.3	Forms and procedures developed for or selected and adapted for specific information-collection need (vii)	Try out forms and procedures (including questions) and revise on the basis of tryout results (viii)	Information-collecting forms and procedures suitable for describing and analyzing criterion behavior under study (ix)

// *means no chain is involved (either a or b or c may follow A.5(1))*

STEP A.5

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.2(a)	-MATRIX: Variations in performance complexity . . . 94	-MATRIX: Selection of forms appropriate to level of detail required . . 95, 99 -MATRIX: Forms for analyzing performance . .115		-And associated QUESTIONS: A.5(1) . . . . .101 A.5(2) . . . . .105 A.5(3) . . . . .109 A.5(4) . . . . .117 A.5(5-7) . .129-134
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3	-MATRIX: Acceptability of information collected . . 209	-MATRIX: Adapting forms and questions . . 207 -MATRIX: Revising information-collecting forms, questions, procedures . . 210	-MATRIX: Desirable sampling properties . . . 205	

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Forms are developed to meet information needs in order to perform:* *... task descriptions* *... task analysis* *... learning analysis* *... mode analysis* *... audience analysis*
WHAT YOU WILL WORK FROM	(1) Identified need to collect descriptions of and perform analyses of the criterion behavior.
WHAT YOU WILL DO	(1) Develop forms and procedures required to meet information collection needs.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub STEP	A.5.1

INPUT	ACTION	OUTPUT
Need to obtain, store, and process information about criterion behavior i	Develop forms and procedures that meet as many of the information collecting requirements as possible ii	Forms and procedures which meet multiple information-collecting needs iii

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
		-MATRIX: Desirable properties of information collecting techniques . 83, 84 -Examples . . 85-87 -MATRIX: Collecting critical elements 89	

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			
Selection of information-collecting techniques	A.2.2			

Sub-STEP A.5.1

JOB DIAGRAM I

INPUT	ACTION	OUTPUT
Need to obtain, store, and process information about criterion behavior — i	Develop forms and procedures that meet as many of the information collecting requirements as possible — ii	Forms and procedures which meet multiple information-collecting needs — iii

Need to Perform:		*Forms or Procedures t*
Task description — i.a	Develop forms or procedures to meet this need — ii.a	Describe -INPUTS -ACTIONS -OUTPUTS — iii.a
Task analysis — i.b	Develop forms or procedures to meet this need — ii.b	Identify -DISCRIMINATIONS -GENERALIZATIONS -ASSOCIATIONS -CHAINS — iii.b
Learning analysis — i.c	Develop forms or procedures to meet this need — ii.c	Identify BARRIERS to -Discriminations -Generalizations -Associations -Chains — iii.c
Mode analysis — i.d	Develop forms or procedures to meet this need — ii.d	Identify MODE of: -Inputs -Actions -Outputs — iii.d
Audience analysis — i.e	Develop forms or procedures to meet this need — ii.e	Identify -ENTERING SKILL LEVELS -TYPICAL LEARNING PROBLEMS — iii.e

BACKGROUND INFORMATION

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Types of information required for five types of analysis	83
Desirable properties of information-collection techniques and forms	84-87
Desirable properties of questions to use in information collection	89

Sub-STEP A.5.1

JOB DIAGRAM II

INPUT	ACTION	OUTPUT
Need to obtain, store, and process information about criterion behavior i	Develop forms and procedures that meet as many of the information collection requirements as possible ii	Forms and procedures which meet multiple information-collecting needs iii

		Product
Need to obtain information i.a	Develops questions, forms, or procedures which elicit information ii.a	Forms, questions, or procedures which ELICIT the types of information needed in subsequent steps iii.a
Need to record information i.b	Develops forms and procedures which can record information ii.b	Forms which RECORD the information in a form suitable for performance of subsequent steps iii.b
Need to analyze information i.c	Develops forms and procedures which facilitate the analysis of information ii.c	Forms which already accomplish some or all of the intended ANALYSES iii.c
Need to summarize information i.d	Develops forms and procedures which facilitate the summary of information ii.d	Forms which can be SUMMARIZED in a way that lends itself to further analysis iii.d
Need to organize information i.e	Develops forms and procedures which facilitate the organization of information ii.e	Forms which can ORGANIZE the information at levels of detail appropriate for various analyses iii.e

A.5.1

TYPES OF INFORMATION REQUIRED FOR FIVE TYPES OF ANALYSIS*

STANDARDS MATRIX

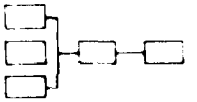
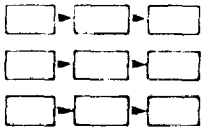
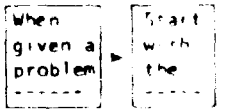
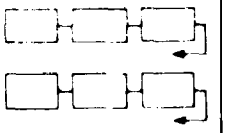
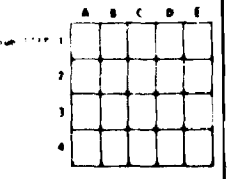
TYPES OF ANALYSIS	TASK DESCRIPTION	TASK ANALYSIS	LEARNING ANALYSIS	MODE ANALYSIS	AUDIENCE ANALYSIS
REQUIRED INFORMATION	-*Description of INPUTS:* -*The conditions presented to the performer under which he must take an action* -*Description of ACTIONS:* -*The action the performer should take for the presented set of conditions* -*Description of OUTPUTS:* -*The nature of the output* -*Standards for acceptability (for tangible outputs, e.g., products)*	-*Identification of DISCRIMINATIONS:* -*Inputs or outputs to be differentiated* -*Identification of GENERALIZATIONS:* -*Range of inputs or outputs to be treated alike* -*Range of actions that are inter-substitutable* -*Identification of ASSOCIATIONS:* -*Inputs and actions to be associated* -*Identification of CHAINS:* -*Series of contingent associations*	*Identification of difficulty levels and their causes for:* -*DISCRIMINATIONS* -*Similarity* -*No. of properties* -*No. of inputs (outputs)* -*GENERALIZATIONS* -*Dissimilarity* -*No. of properties* -*No. of inputs (outputs)* -*ASSOCIATIONS* -*Strength of existing associations* -*No. of associations* -*CHAINS* -*Length of chain* -*Discrimination problem for outputs* -*Existing associations*	*Identification of <u>mode</u> for:* -*INPUTS and OUTPUTS* -*Visual, audio, kinaesthetic, taste, smell* -*Realistic, reproduced, fabricated* -*Symbolic, verbal, environmental* -*ACTIONS* -*Recognition, editing, production* -*Perceptual, motor, vocal, sub-vocal*	*Characterization of target audience:* -*ENTERING SKILL LEVELS* -*TYPICAL DIFFICULTIES WITH EXISTING CURRICULA OR PROGRAMS*

*Types of information may be obtained during Task A, information collection, or later during Task B, analysis of information. Whenever possible, all types should be obtained during Task A--in the interest of efficiency.

A.5.1

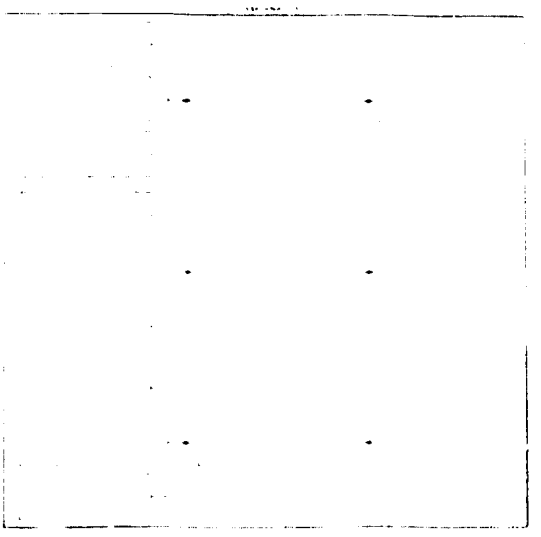
FIVE DESIRABLE PROPERTIES OF INFORMATION-COLLECTION TECHNIQUES

STANDARDS MATRIX

PROPERTIES OF FORMS	*Materials or procedures themselves are structured to ELICIT the types of information required for describing and analyzing the criterion behavior*	*Forms used to obtain information also provide a suitable place to RECORD the information, requiring no (or minimal) later rerecording or modification*	*Forms used to obtain and record information also represent a partial or complete ANALYSIS of criterion behavior, i.e., description and analysis of criterion behavior are performed simultaneously, i.e., some types of forms can be used to complete or expand the analysis*	*Analysis results recorded on forms are in a format easily SUMMARIZED for use in later, additional analyses*	*Forms permit the ORGANIZATION of information to allow:* *-The collection of information at different levels of detail at different times* *-Cross-referencing between different levels of detail*
SUGGESTED METHODS OR FORMS	-Labels, headings -Lists of questions accompanying forms -Questions printed on forms -Format of forms	-Formats of forms allow information recorded to be analyzed as -Recording requirements produce significant and appropriate information for later procedures	Forms which are used to describe behavior are in formats which provide analysis results	-Matrices with standardized headings used throughout -Analyses contingent on results of other analyses use similar headings	-Varying formats with specific formats tabbed for specific level of detail -Standardized numbering systems permitting cross-referencing
EXAMPLES	-Labels identifying required types of information INPUT-ACTION-OUTPUT  -Formats which are reminders of required types of information  DIAGRAM FOR A DISCRIMINATION 	-Statement of objectives can be readily and directly derived from adequately recorded task descriptions  	-Diagrammatic presentation of task description also constitutes a task analysis EXAMPLE OF A CHAIN 	-Diagrams summarizing learning difficulties for each sub-step can be used to summarize learning difficulties for a complete task or series of tasks, thus characterizing the difficulties of a major unit LEARNING PROBLEM TYPES  	-Formats themselves differentiate -Tasks -Steps -Sub-steps -Skill elements -Use of folders for higher level descriptions e.g., task folder includes forms for steps and sub-steps -Numbering or lettering systems identify level of detail e.g., Tasks - A Steps - 1, 2, 3 Sub-steps - i, ii, iii Skill elements - ia, ib, ic

A.5.1

PROPERTIES OF FORMS WHICH ELICIT AND ALLOW RECORDING OF REQUIRED TYPES OF INFORMATION

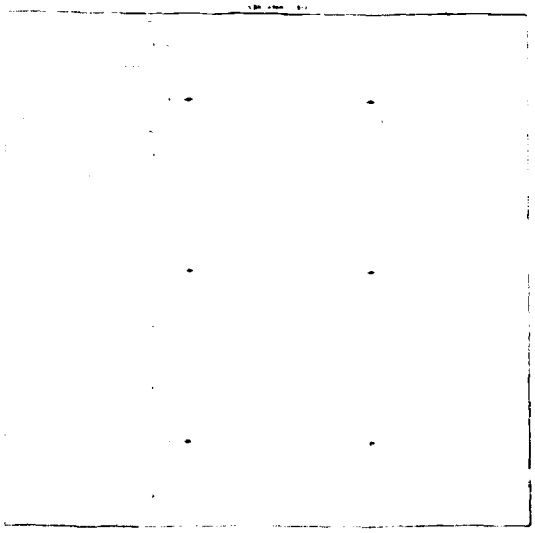
EXAMPLES OF FORMS	DISCUSSION OF THEIR PROPERTIES
	(1) The format of the form structures the observation of criterion behavior or verbal interview about criterion behavior so that the information elicited tends to be comprehensive and relevant. e.g., for the diagram to be properly completed, the observer/interviewer has to look for or ask for relevant discriminations, generalizations, and associations. (2) The record of the observation/interview process is suitable as a basis for other analyses to be performed simultaneously or later on. e.g., learning analysis (see the diagrams below) or more detailed task analysis.
c. LEARNING ANALYSIS level of difficulty in acquiring → DISCRIMINATIONS due to ▽ hi med lo similarity No. of properties No. of inputs INPUT GENERALIZATIONS hi med lo dissimilarity No. of properties No. of inputs	(1) The listing of input characteristics which affect the difficulty of acquiring a discrimination (e.g., "similarity," "No. of input properties," and "No. of classes of inputs") directs the observer/interviewer to look for or ask for information pertinent to these characteristics (2) The record of X's in the cells is sufficient *without modification* for later decisions about instructional strategies for teaching discriminations or generalizations relevant to the inputs in question.

*Examples selected from forms used in this volume

A.5.1

PROPERTIES OF FORMS WHICH FACILITATE ANALYSIS AND/OR SUMMARY OF INFORMATION

EXAMPLES OF FORMS



LEARNING ANALYSIS

level of difficulty in acquiring →

DISCRIMINATIONS

due to ▽ similarity	hi	med	lo
No. of properties			
No. of inputs			

HI DIFFICULTY IN ACQUIRING

Sub-Steps	d	g	a	c
1				
2				
3				
4				
5				
⋮				
n				

d = discriminations; g = generalizations
a = associations; c = chains

*Examples selected from forms used in this volume.

DISCUSSION OF THEIR PROPERTIES

(1) The forms used to record a description of inputs, actions, and outputs, when completed, also provide an analysis of the criterion behavior

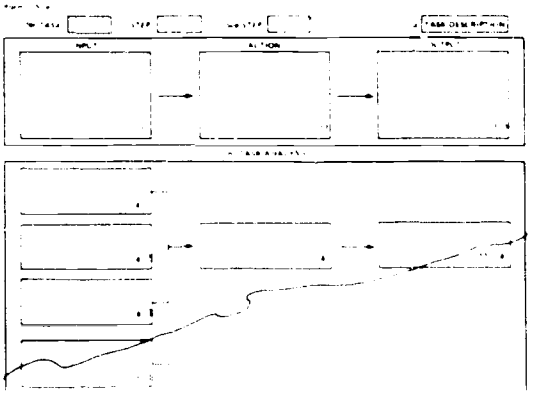
e.g., relevant discriminations, generalizations, and associations are also identified

(1) the results of one analysis, e.g., the estimate of the difficulty in acquiring a discrimination in each sub-step, can be readily summarized in other analyses (on other forms). In this example, the whole step can be characterized as to the type of learning problems involved in its acquisition by summarizing a number of separate analyses within one compatible matrix. The matrix results may then be used for further decisions in the development process (in this example, decisions about appropriate types of practice to be recommended for teaching these sub-steps).

A.5.1

PROPERTIES OF FORMS WHICH FACILITATE THE ORGANIZATION OF INFORMATION

EXAMPLE OF FORM



*Examples selected from forms used in this volume.

DISCUSSION OF ITS PROPERTIES

(1) The upper and lower parts of the form permit the description of two related levels of detail on one form.

(2) There is provision at the top of the form for crossreferencing descriptions at varying levels of detail

(3) A standardized numbering system is used to identify the level of detail presented on the form

e.g., i, ii, iii, etc., are reserved for sub-steps

Sub-STEP A.5.1

JOB DIAGRAM III

INPUT	ACTION	OUTPUT
Need to obtain, store, and process information about criterion behavior — i	Develop forms and procedures that meet as many of the information collecting requirements as possible — ii	Forms and procedures which meet multiple information-collecting needs — iii
PERFORMANCE OF EXPERT to be observed or described — i.a	Develop forms and procedures capable of describing and analyzing needed information — ii.a	*Forms and procedures meeting the criteria summarized in MATRICES on pages [redacted] and [redacted]* — iii.a
CRITICAL ELEMENTS OF PERFORMANCE of many job holders to be observed or described — i.b	Develop forms and procedures for collecting information which can later be summarized into a description of terminal behavior — ii.b	Forms and procedures for piecemeal collection of relevant information from many respondents — iii.b
KNOWLEDGE DOMAIN to be described using JUDGMENTS of experts — i.c	Develop forms and procedures capable of describing and analyzing needed information — ii.c	*Forms and procedures meeting the criteria summarized in MATRICES on pages [redacted] and [redacted]* — iii.c

A.5.1

STANDARDS MATRIX

FOUR DESIRABLE PROPERTIES OF QUESTIONS (IN INTERVIEWS OR ON QUESTIONNAIRES) FOR COLLECTING DESCRIPTIONS OF CRITICAL ELEMENTS IN JOB PERFORMANCE

GOAL OF QUESTIONS	VALIDITY OF ANSWERS	RELIABILITY OF ANSWERS	COMPREHENSIVENESS OF ANSWERS	RELEVANCE TO OTHER ANALYSES
PROPERTIES OF QUESTIONS	-Questions elicit answers identifying behaviors or incidents critical to a specified outcome	-Questions elicit objective descriptions (rather than subjective judgments) of the behavior -Questions stress recent incidents to avoid memory distortions	-Questions elicit answers that identify: -Antecedents of behaviors -The behavior itself -The outcome of the behavior -Questions are directed to specific major areas to insure complete coverage	-Questions identify: -Discriminations -Generalizations -Associations -Chains -Questions identify: -Success and failure points in performance
EXAMPLES	e.g., "Think of an incident in which someone did something that made the difference between success and failure in _____" e.g., "Describe what he did that had an effect on work completion"	e.g., "Describe something the man did that resulted in: -A breakdown in production -The successful repair of equipment" e.g., "Think of the last time you saw someone do something which led to _____"	e.g., "What did he do? What led up to this behavior? What was the outcome?" e.g., "Can you think of an incident having to do with _____"	e.g., "Describe the conditions which someone failed to differentiate" e.g., "Describe the conditions which he differentiated but shouldn't have"

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*The selection of FORMS needed to describe and analyze criterion behavior which includes "performance".*
WHAT YOU WILL WORK FROM	(1) Plans to describe the performance of an expert (the same as model).
WHAT YOU WILL DO	(1) Select from available FORMS those necessary for describing and analyzing the criterion behavior.
FORMS YOU WILL USE	Available FORMS -- A.5(1)-(7)

DESCRIPTION OF Sub STEP	A.5.2(a)

INPUT	ACTION	OUTPUT
Plans to describe and analyze [illegible] of an [illegible] (iv)	Select appropriate forms for recording observation of performance or to obtain and record description of performance (v)	Selection of forms for describing performance at an appropriate level of detail and for analyzing performance (vi)

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Variations in performance complexity . . . 94	-MATRIX: Selection of forms appropriate to level of detail required . . 95, 99 -MATRIX: Forms for analyzing performance . .115		And associated QUESTIONS: A.5(1) . . . . .101 A.5(2) . . . . .105 A.5(3) . . . . .109 A.5(4) . . . . .117 A.5(5-7) . .129-134

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			A.5(1) TASKS
Selection of information-collecting techniques	A.2.2			A.5(2) STEPS
				A.5(3) SUB-STEPS
				A.5(4) a. Task Description b. Task analysis
				A.5(5-7) Supplements

Sub-STEP A.5.2(a)

JOB DIAGRAM

INPUT		ACTION		OUTPUT
Plans to describe and analyze PERFORMANCE of an EXPERT (iv)	→	Select appropriate forms for recording observation of performance or to obtain and record description of performance (v)	→	Selection of forms for describing performance at appropriate level of detail and for analyzing performance (vi

[illegible]		*Decision*		
Relatively COMPLEX Performance iv.a	→	Select forms capable of describing performance at <u>more</u> levels of detail v.a	→	Selection of forms to be used in TASK DESCRIPTION of: -Tasks -Steps -Sub-steps and in TASK ANALYSIS o -Skill elements in sub-steps vi.
Relatively SIMPLE Performance iv.b	→	Select forms capable of describing performance at <u>fewer</u> levels of detail v.b	→	Selection of forms to be used in TASK DESCRIPTION of: -Sub-steps and in TASK ANALYSIS o -Skill elements in sub-steps vi.

BACKGROUND INFORMATION

A.5.2(a)

CRITERIA FOR IDENTIFYING WHETHER PERFORMANCE IS LIKELY TO BE COMPLEX OR SIMPLE

IDENTIFICATION MATRIX

CRITERIA	Performance consists of: -Long chains -Difficult discriminations or generalizations -Difficult concepts	Performance consists of: -Short chains -Relatively easy discriminations or generalizations -Relatively easy associations
JUDGMENT OF COMPLEXITY	Relatively COMPLEX Performance	Relatively SIMPLE Performance
EXAMPLES	-Developing a science curriculum -Developing a computer program -Flying an airplane -Carrying out a research project -Deriving a statistical formula	-Doing addition or subtraction -Drawing a map in geography -Bisecting an angle in geometry -Reciting a four line poem -Solving for an unknown in a statistical formula

A.5.2(a)

SELECTION OF NUMBER OF VARIETY OF FORMS BASED ON JUDGMENT OF DEGREE OF PERFORMANCE COMPLEXITY

DECISION MATRIX

CONDITIONS	Performance is relatively COMPLEX	Performance is relatively SIMPLE
ACTION TO TAKE	-Select forms to allow description of performance at more levels of detail	-Select forms to allow description of performance at fewer levels of detail
EXAMPLES OF LEVELS OF DETAIL	EXAMPLE from "driving" performance	EXAMPLE from "arithmetic"
Description at TASK Level	A. Basic Control Tasks B. General Driving Tasks (C.) Tasks Related to Traffic Conditions D. Tasks Related to Roadway Characteristics E. Tasks Related to the Environment F. Tasks Related to the Car	
Description at STEP Level	(C.1) Following C.2 Passing C.3 Entering and Leaving Traffic C.4 Lane Changing C.5 Parking C.6 Reacting to Traffic	ADDING TWO-DIGIT NUMBERS
Description at Sub-STEP Level*	C.1.a Maintains adequate following distance from lead vehicle C.1.b Adjusts speed to change in speed of lead vehicle C.1.c Observes traffic to anticipate changes in lead vehicle velocity	1. Adds numbers in units column 2. Records unit digit of sum 3. Adds remaining tens digit to tens column 4. Records total

*Recognition can be carried out to the sub-sub-step level when necessary.

PERFORMING A TASK DESCRIPTION*

This section contains forms (A.5(1) to A.5(3)) recommended for use when an expert describes his own performance or when it is described by someone who has observed the performance.

CONTENTS

*Task analysis begins when task description has been completed at lowest level of detail, i.e., description of Sub-STEPS or of Sub-Sub-STEPS.

See page 112 for FORMS to use in TASK ANALYSIS.

A.5.2(a)

FORMS TO USE IN DOING A TASK DESCRIPTION OF PERFORMANCE AT DIFFERING LEVELS OF DETAIL

DECISION MATRIX

REQUIRED LEVELS OF DETAIL ▷	Description of TASKS	Description of STEPS	Description of Sub-STEPS Description of Sub-Sub-STEPS
FORMS TO USE	*Form A.5(1) SUMMARY OF TASKS*	*Form A.5(2) SUMMARY OF STEPS*	*Form A.5(3) SUMMARY OF SUB-STEPS*
PARTIAL ILLUSTRATIONS			
LEVEL OF DETAIL TO BE DESCRIBED	Most general description	Breakdown of tasks into less general steps	Breakdown of steps into still less general sub-steps; and continued, if necessary, to more specific sub-sub-steps
RECOMMENDED REFERENCING SYSTEM	A, B, C, D, E, F Etc.	A.1 B.1 C.1 A.2 B.2 C.2 A.3 B.3 C.3 Etc. ⋮ ⋮ ⋮ A.n B.n C.n	A.1.1 A.2.1 A.1.2 A.2.2 A.1.3 A.2.3 Etc. ⋮ ⋮ A.1.n A.2.n

QUESTIONS FOR FORMAT B

FOR SUMMARY OF TASKS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Let's see if we can get a big picture or an overview or what it is you do."

QUESTION

"What are the major tasks or functions involved when you _____ ?"
activity

ALTERNATES

"What are the major tasks or functions involved in performing a _____ ?"
activity

"What are the major tasks or functions involved in _____ ?"
activity

"What are the major tasks or functions involved in performing as a _____ ?"
job title

SPECIFIC EXAMPLES

QUESTION

"What are the major tasks or functions involved when you *write an essay*?"

ALTERNATES

"What are the major tasks or functions involved in performing *an orthopedic examination*?"

"What are the major tasks or functions involved in *building a curriculum*?"

"What are the major tasks or functions involved in performing as a *researcher*?"

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."*

*If possible, provide an example from the performance area under study.

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A. *Gathers clinical information*
B. *Uses special diagnostic information*
C. *Develops a diagnosis*
D. *Decides on appropriate care*
E. *Implements treatment*
F. *Provides continuing care*

Form A 5 (1)

SUMMARY OF **TASKS**

A

B

C

D

E

F

G

H

I

J

Form A 5 (1)

SUMMARY OF **TASKS**

K

L

M

N

Etc.

NOL

A.5.2(a)

RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX ▼

REFERENT ▷	TASKS	STEPS	Sub-STEPS	a. Task Description	b. Task Analysis	c. Learning Analysis / d. Mode Analysis
RECOMMENDED LABELS ▷	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers	Same as for Sub-STEPS	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers	None Needed
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v, vi	A.1.1 i, ii, iii A.1.2 iv, v, vi A.1.3 vii, viii, ix, Etc. A.2.1 i, ii, iii A.2.2 iv, v, vi Etc. A.3.1 i, ii, iii A.3.2 iv, v, vi Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c iv.a v.a vi.a Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 i.c.3 Etc.	

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, let's see if we can identify the major steps within each task."

QUESTION A

"What are the major steps involved in _____ (Task A)?"

QUESTION A.1

"For Step 1, _____ (Step), what are the input conditions, the actions taken, and the resulting outputs?"

QUESTIONS A.2-A.n

Repeat same type of question as in A.1 for all steps in Task A.

QUESTIONS B-B.n

Repeat same type of question as A, then A.1-A.n, for all steps in Task B.

Repeat the above procedure for all tasks.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."

SPECIFIC EXAMPLES

"What are the major steps involved in *gathering clinical information*?"

"For Step 1, *asking for a medical history*, what are the input conditions, the actions to be taken, and the resulting outputs?"

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A. *Gathering clinical information*

A.1 *Obtain a medical history*

INPUT	ACTION	OUTPUT
Sources of information	*Ask about or check into patient's past medical history*	*Record of past illnesses*

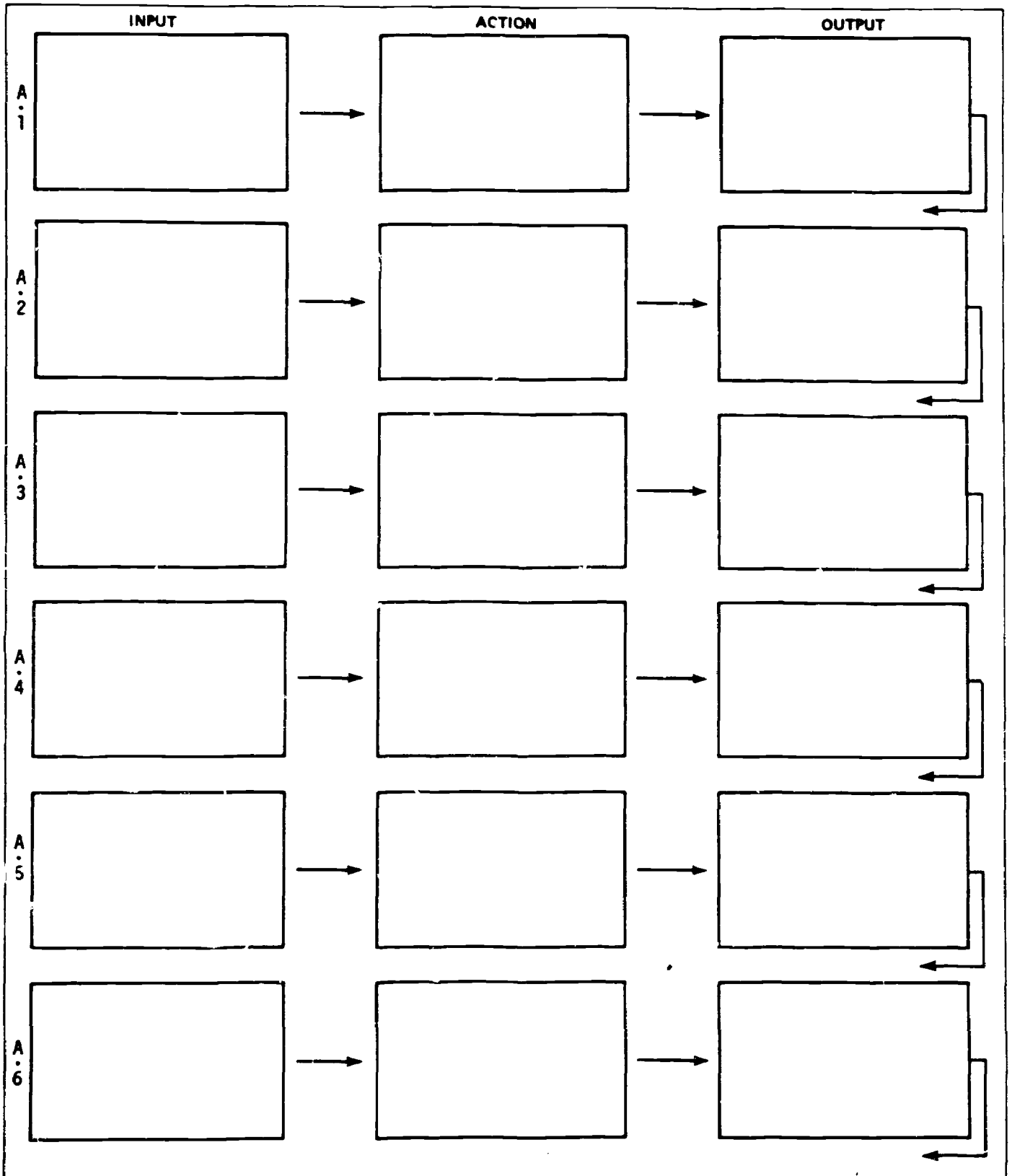
A.2 *Perform a physical examination*

Patient	*Perform all relevant examinations*	*Record of examination results*

Form A-5 (2)

for TASK [A]

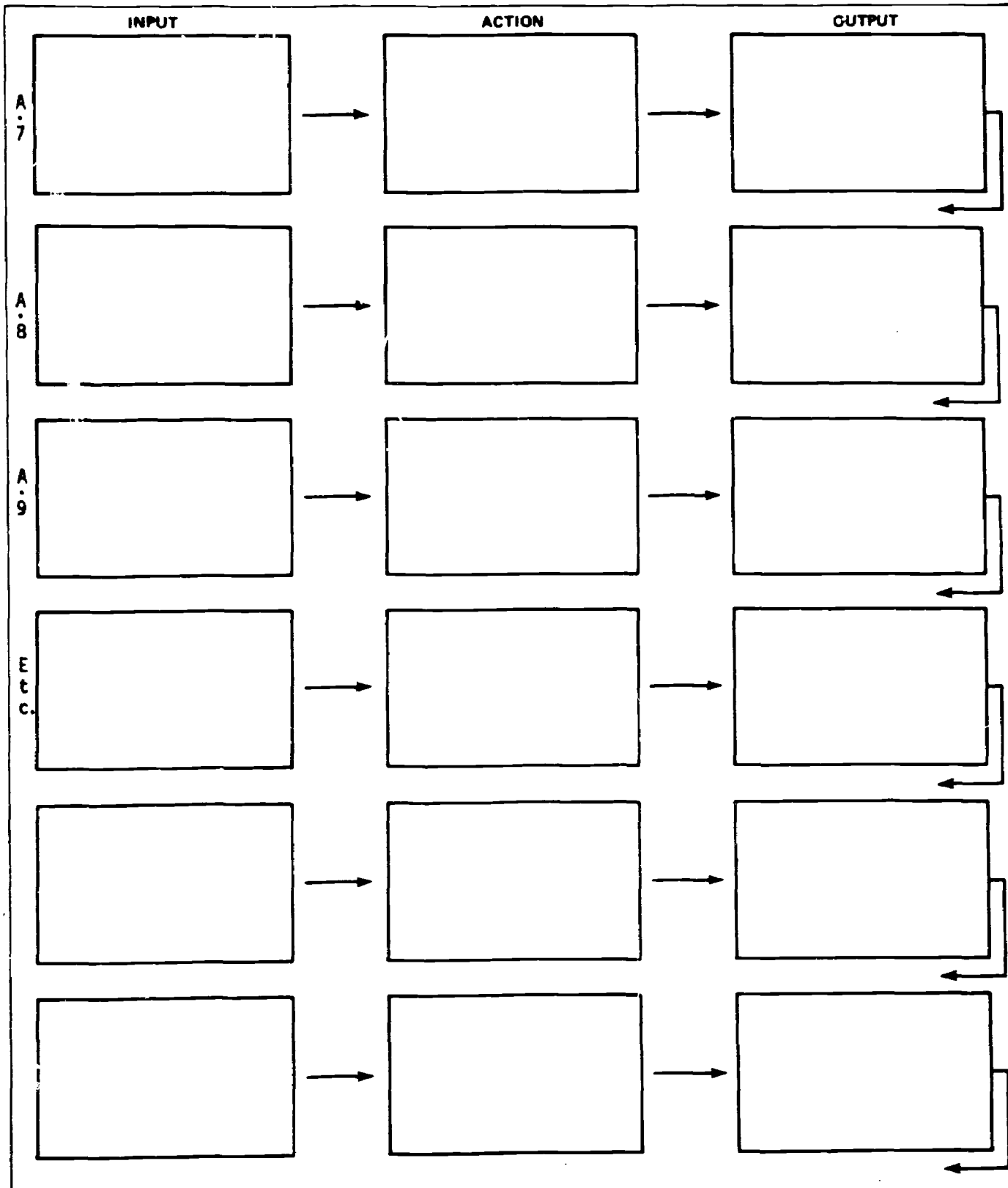
SUMMARY OF [STEPS]



Form A-5 (2)

for TASK [A]

SUMMARY OF [STEPS]



A.5.2(a) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS	a. Task Description	b. Task Analysis	c. Learning Analysis / d. Mode Analysis
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers	Same as for Sub-STEPS	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers	None Needed
	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v,	A.1.1 i, ii, iii A.1.2 iv, v, vi A.1.3 vii, viii, ix, Etc. A.2.1 i, ii, iii A.2.2 iv, v, vi Etc. A.3.1 i, ii, iii A.3.2 iv, v, vi Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c iv.a v.a vi.a Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 i.c.3 Etc.	

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, let's see if we can identify the major sub-steps within each step."

QUESTION A.1

"What are the sub-steps involved in _____ ?"
Step A.1

QUESTION A.1.1

For Sub-Step A.1.1, _____,
Sub-Step A.1.1
what are the input conditions, the actions taken, and the resulting outputs?"

QUESTIONS A.1.2-A.1.n

Repeat same type of question as in A.1.1 for all sub-steps in Step A.1.

Repeat same type of question as above for all sub-steps in all other steps in Task A.

Repeat the above procedure for all tasks.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."

SPECIFIC EXAMPLES

"What are the major sub-steps involved in *obtaining a medical history*?"

"For Sub-Step A.1.1, *asking the patient about his past illnesses*, what are the input conditions, the actions to be taken, and the resulting outputs?"

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A.1 *Obtain a medical history*

A.1.1 *Ask patient for medical history*

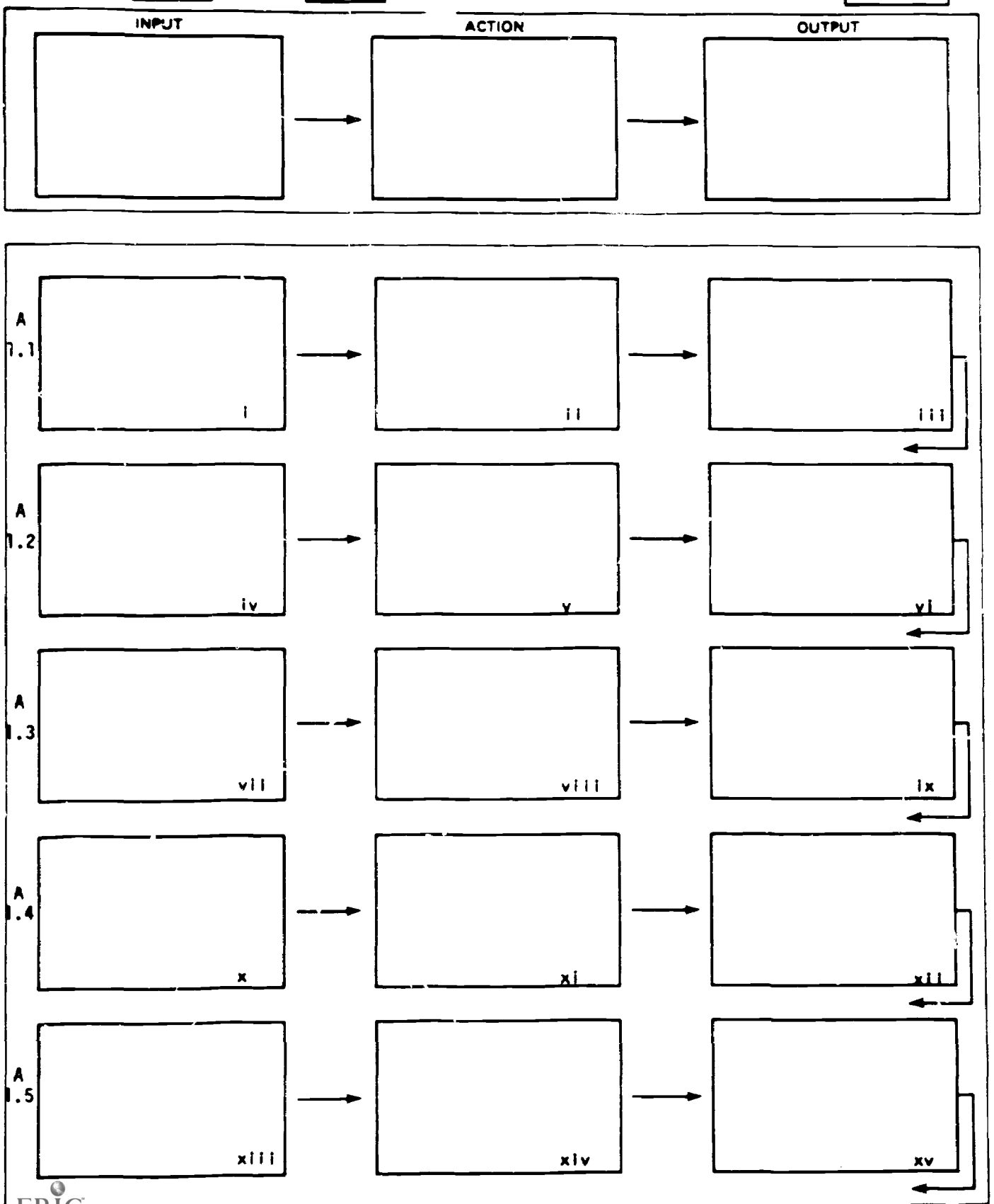
INPUT	ACTION	OUTPUT
Patient	Question about past illnesses	Identification of past illnesses

A.1.2 *Check records for patient's history*

Patient's medical record	Check records for history of illness	Identification of past illnesses

Form A-5 (3)

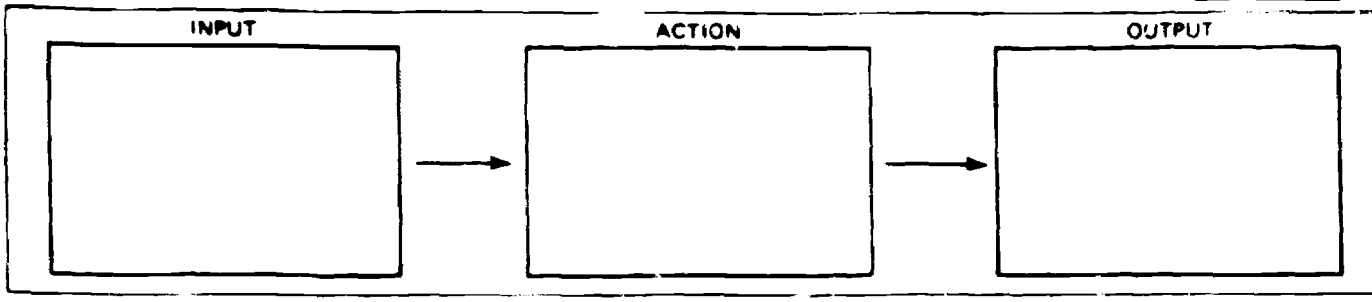
for TASK A *STEP* 1 SUMMARY OF Sub-STEPS

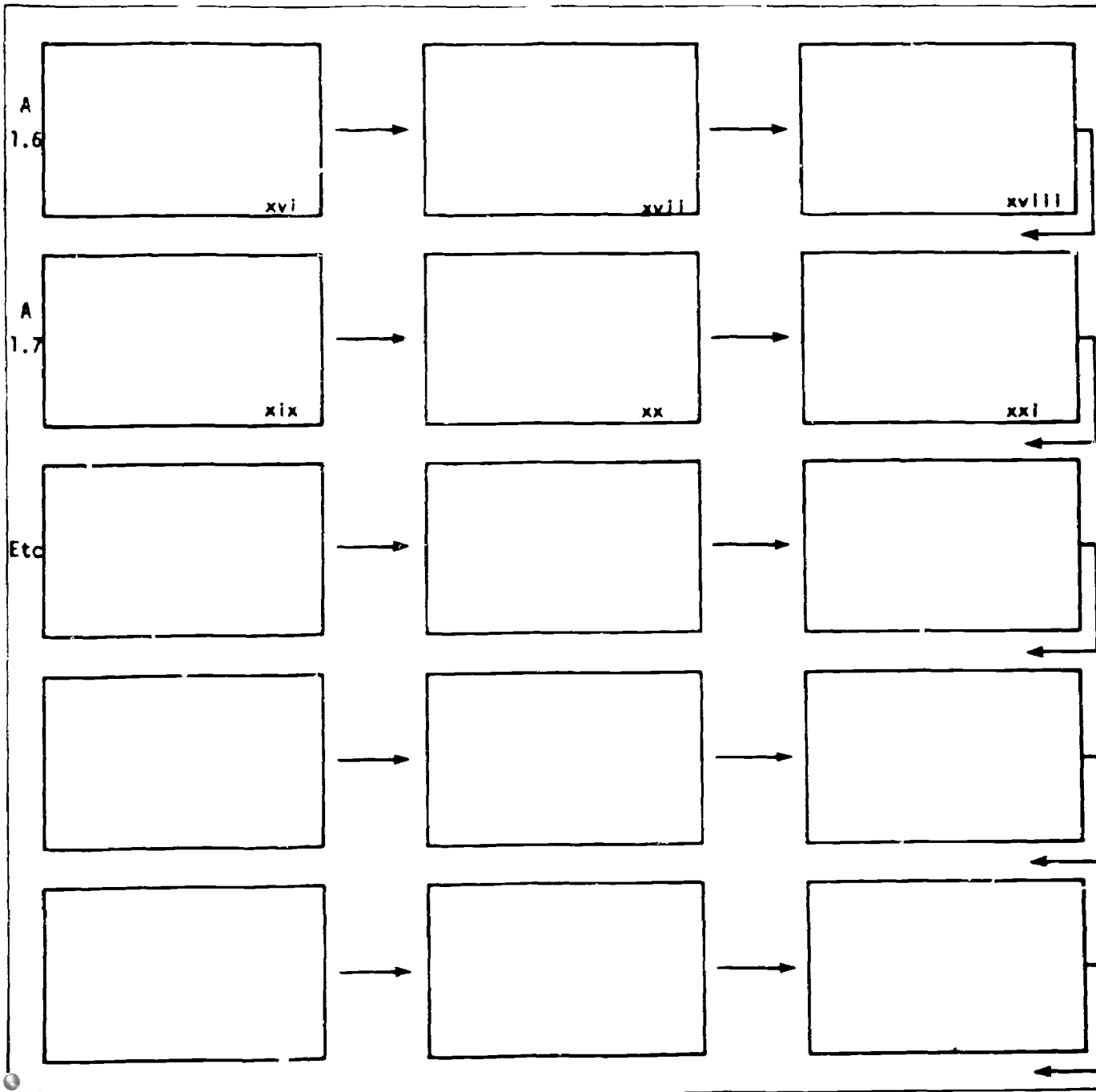


Form A-5 (3)

for TASK [A] STEP [1]

SUMMARY OF [Sub-STEPS]





A 5.2(a)

RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS	a. Task Description	b. Task Analysis	c. Learning Analysis d. Mode Analysis
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers	Same as for Sub-STEPS	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers	None Needed
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v, vi	A.1.1 i, ii, iii A.1.2 iv, v, vi A.1.3 vii, viii, ix, Etc. A.2.1 i, ii, iii A.2.2 iv, v, vi Etc. A.3.1 i, ii, iii A.3.2 iv, v, vi Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c iv.a v.a vi.a Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 i.c.3 Etc.	

PERFORMING A TASK ANALYSIS*

This section contains forms (in yellow) recommended for use when a task analysis is performed with the aid of an expert who describes his own performance or when it is described by someone who has observed the performance. It also contains some supplementary forms.

CONTENTS

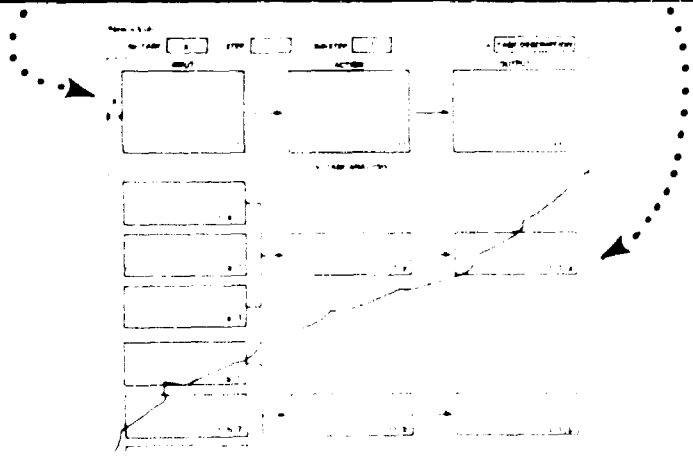
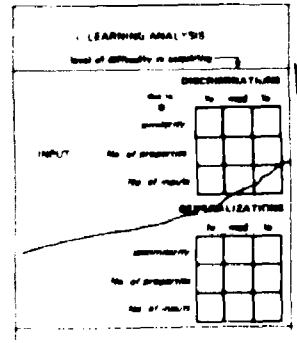
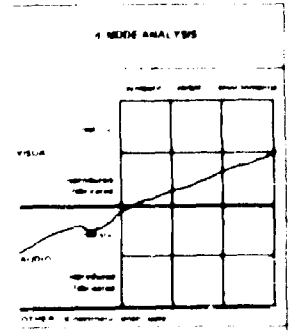
*Task analysis begins when task description has been completed at lowest level of detail, i.e., description of Sub-STEPS or of Sub-Sub-STEPS.

NOTE: "Learning" analysis and "mode" analysis are performed on the right-hand side of FORM A.5(4) on which the task analysis is performed.

A.5.2(a)

FORMS TO USE IN ANALYZING PERFORMANCE: TASK ANALYSIS, LEARNING ANALYSIS, AND MODE ANALYSIS
(Information may be collected at same time task description of performance is being done)

DECISION MATRIX

TYPES OF ANALYSIS	Transfer of task description on FORM A.5(3) at lowest level obtained to	Identification of SKILL ELEMENTS	Identification of LEARNING DIFFICULTIES	Identification of Performance MODES
FORMS TO USE	Form A.5(4) (left-hand page) *a. Task Description*	Form A.5(4) (left-hand page) *b. Task Analysis.*	Form A.5(4) (right-hand page) *c. Learning Analysis.*	Form A.5(4) (right-hand page) *d. Mode Analysis.*
ILLUSTRATIONS				
RECOMMENDED REFERENCING SYSTEM	The numbering system used on Form A.5(3) is transferred to this form (since the form merely repeats the lowest level description provided)	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c Etc. i.a.1 i.a.2 ii.a iii.a i.a.3 i.b.1 i.b.2 ii.b iii.b Etc.	Requires no numbering; is attached as a right-hand page to the material it refers to	Requires no numbering; is attached as a right-hand page to the material it refers to

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, we want some more detail about each sub-step."

QUESTION 1 (Discriminations)

"Let's take Sub-STEP _____ (Sub-Step #). When you are _____ (activity), what different _____ (input conditions) are there that would cause you to take a different course of action?"

QUESTION 2 (Associations)

"For each of these different _____ (input conditions), what different course of action would you take?"

QUESTION 3 (Action Generalization)

"One at a time, let's take each of these _____ (#) actions you mentioned. Are there alternative ways to _____ (action)?"

QUESTION 4 (Input Generalization)

"One by one, let's take these _____ (#) types of _____ (input conditions) you mentioned; are there possible variations within each type that would still lead you to deal with them all in the same way, i.e., _____ (action to be taken)?"

QUESTION 5 (Discriminations - Outputs)

"For each of these _____ (#) _____ (input conditions), what differences in outcomes, if any, are there?"

QUESTION 6

"Are there standards about these _____ (outcomes) which are crucial for satisfactory performance?"

SPECIFIC EXAMPLES

QUESTION 1

"Let's take Sub-STEP *B.5.1*. When you are *gathering information for a report*, what *different kinds of information* might you come across that you would deal with in different ways?"

QUESTION 2

"For each of these different *types of information*, what are the different ways you would *evaluate them*?"

QUESTION 3

"Let's take the first action you mentioned, *writing an abstract*. Are there different ways you might *summarize the information*?"

QUESTION 4

"Let's take the *first* type of *information* you mentioned, *technical articles*. Are there different types of *technical articles* that would nevertheless still lead you to *write an abstract for it*?"

QUESTION 5

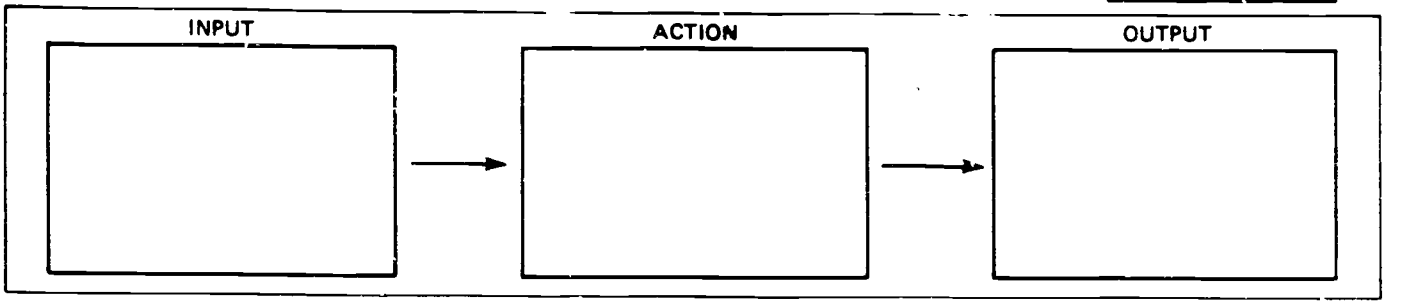
"For the *first type of information* you mentioned, does this lead to *a body of evidence* different from that provided by *the other types of information*?"

QUESTION 6

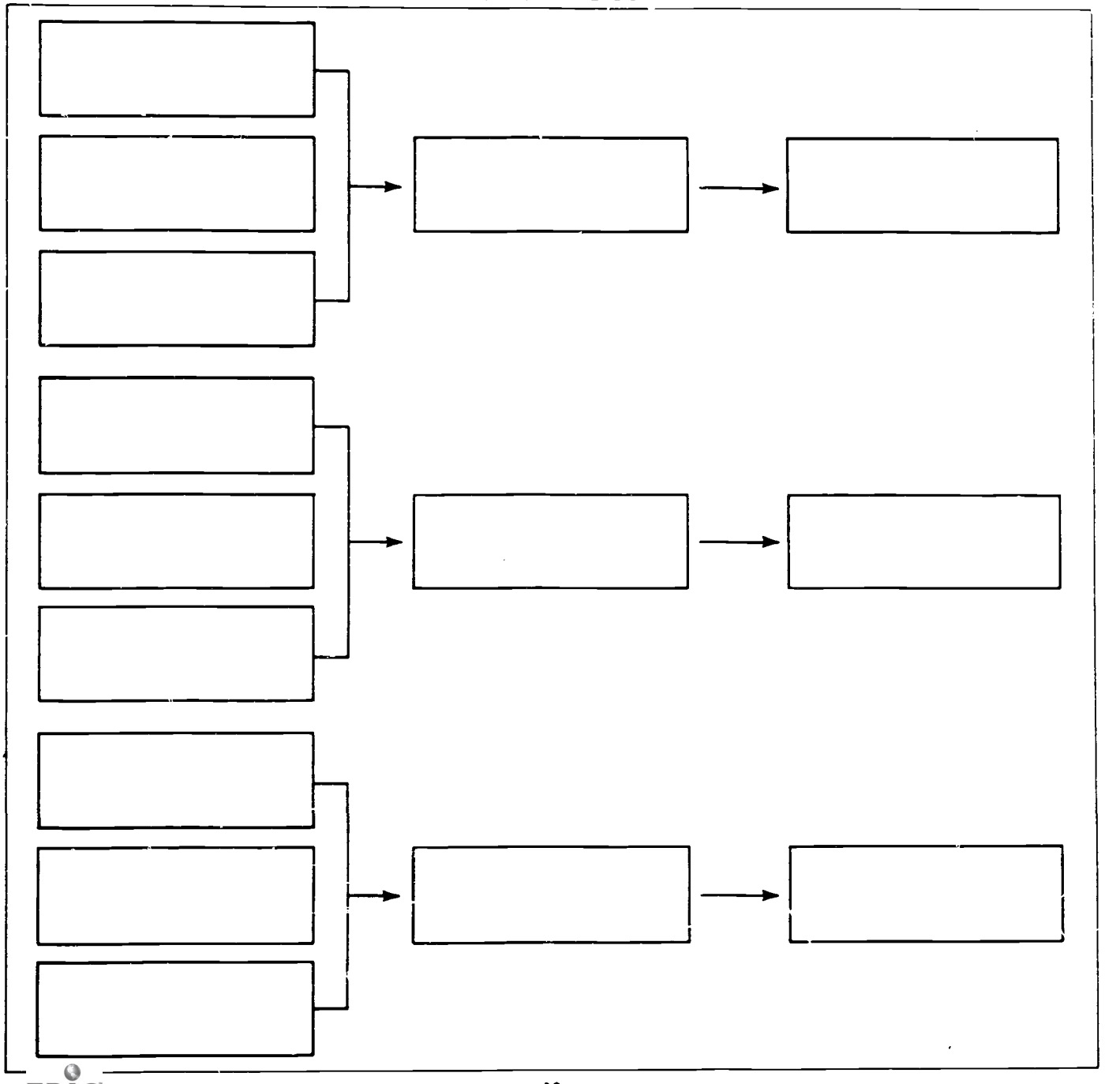
"Are there standards about these *bodies of evidence* which are crucial for satisfactory performance?"

Form A-5 (4)

for TASK [ ] *STEP* [ ] *Sub-STEP* [ ] a. TASK DESCRIPTION



b. TASK ANALYSIS

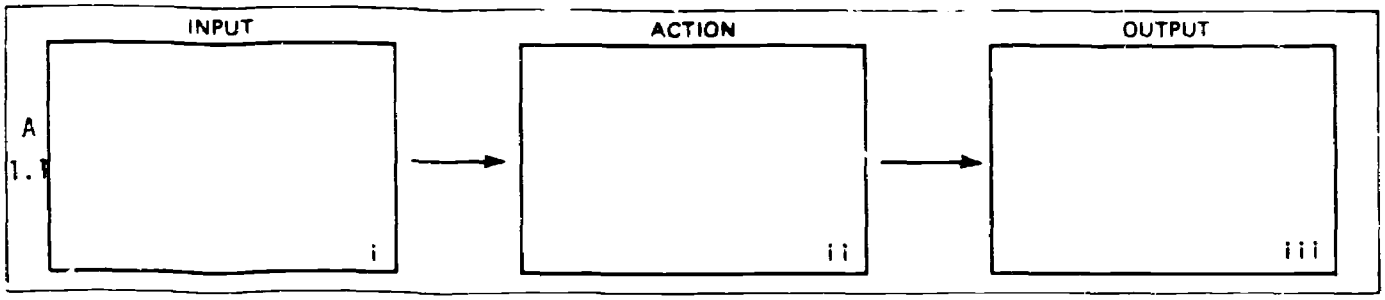


RECOMMENDED QUESTION FORMATS	SPECIFIC EXAMPLES
ORIENTING STATEMENT "Let's analyze the difficulties in learning the skills in this sub-step."	
QUESTION 1 (Re: Discriminations) "Is it difficult to tell the difference between _____ (*input conditions*)?" "Is this difficulty due to the fact that the _____ (*input conditions*) are highly similar?" "What properties of the _____ (*input conditions*) do you have to pay attention to in order to see the difference?"	QUESTION 1 "Is it difficult to tell the difference between *sound and unsound technical articles*?" "How many properties of *technical articles* do you attend to in judging their *soundness*?"
QUESTION 2 (Re: Generalizations) "Within each type of _____ (*input condition*) is it difficult to see the similarities (ignore the differences) if present?" "Is this due to a high degree of dissimilarity among _____ (*input conditions*)?" "What properties of the _____ (*input conditions*) do you have to pay attention to in order to see the similarities?"	QUESTION 2 "Within the class of *sound articles*, is it difficult to recognize the range of what are *sound articles*?" "Is this due to dissimilarity among them?"
QUESTION 3 (Re: Associations) "For any of these _____ (*input conditions*), is there an existing action people now perform very often? What?"	QUESTION 3 "For either of these two classes of *sound* and *unsound articles*, is there an existing action people normally take?"
QUESTION 4 (Re: Outputs) *Repeat same type of questions as for inputs.*	QUESTION 4 *See #1 above.*

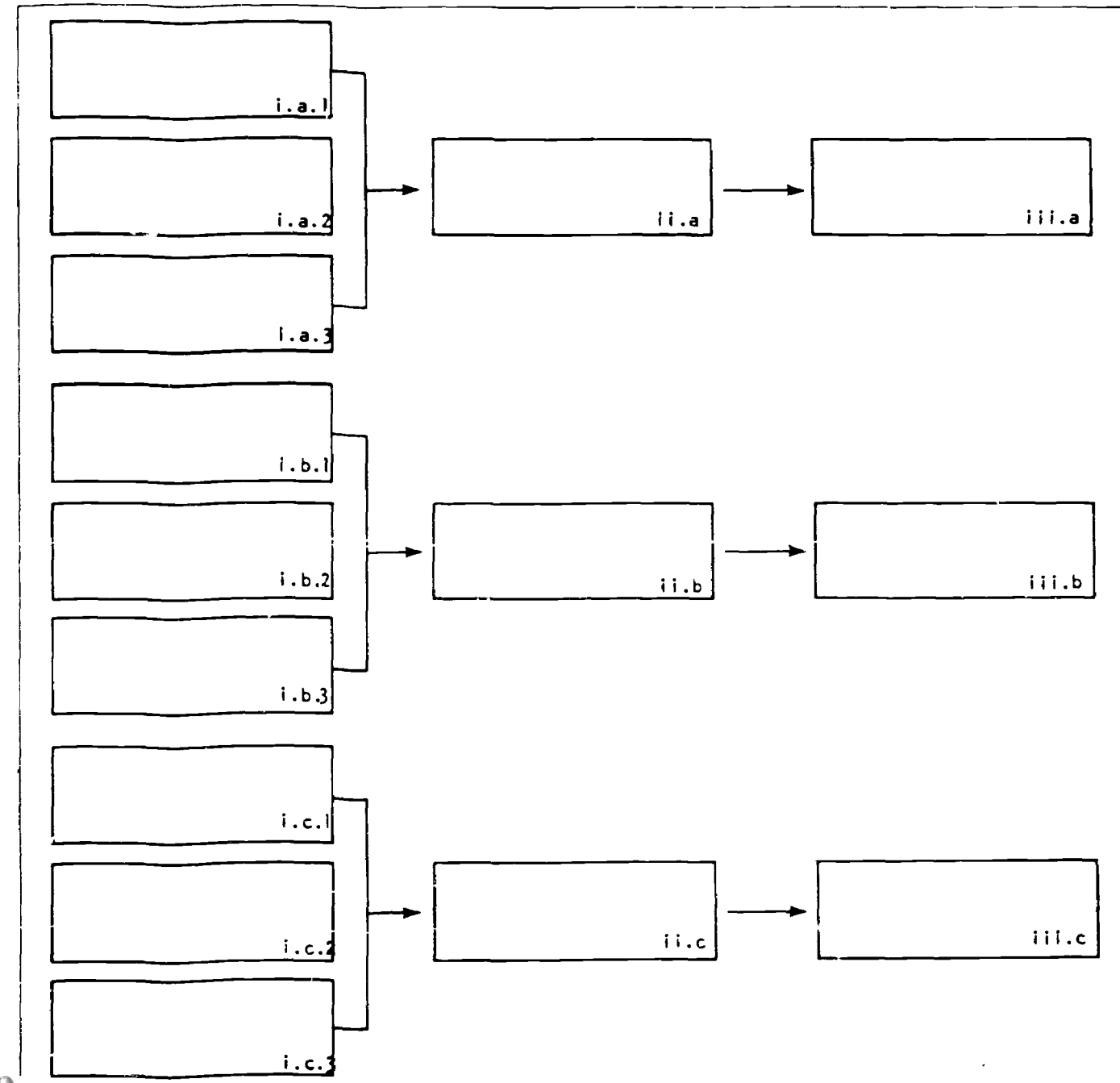
COMPETENCY ANALYSIS ▽	c. LEARNING ANALYSIS — level of difficulty in acquiring →	d. MODE ANALYSIS
INPUT recall ☐ transfer ☐	**DISCRIMINATIONS** (due to ▽) — hi / med / lo *similarity* *No. of properties* *No. of inputs** **GENERALIZATIONS** — hi / med / lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic / verbal / environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER: Kinaesthetic, smell, taste
ACTION/ CHAIN recall ☐ transfer ☐	**ASSOCIATIONS** (due to ▽) — hi / med / lo *No. of associations* *associative strength of other actions* **GENERALIZATIONS** — hi / med / lo *integrative strength of action* **CHAINS** — hi / med / lo *length of chain* *output discrimination problems* *associative strength of other actions*	perceptual / motor / vocal / sub-vocal recognition editing production
OUTPUT recall ☐ transfer ☐	**DISCRIMINATIONS** (due to ▽) — hi / med / lo *similarity* *No. of properties* *No. of inputs* **GENERALIZATIONS** — hi / med / lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic / verbal / environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER: Kinaesthetic, smell, taste

Form A-5 (4)

for TASK [A] STEP [1] Sub-STEP [1] a. TASK DESCRIPTION



b. TASK ANALYSIS



A.5.2(a) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS	a. Task Description	b. Task Analysis	c. Learning Analysis / d. Mode Analysis
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers	Same as for Sub-STEPS	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers	None Needed
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v, vi	A.1.1 i, ii, iii A.1.2 iv, v, vi A.1.3 vii, viii, ix, Etc. A.2.1 i, ii, iii A.2.2 iv, v, vi A.3.1 i, ii, iii A.3.2 iv, v, vi Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c iv.a v.a vi.a Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 i.c.3 Etc.	

ACTUAL FORMS

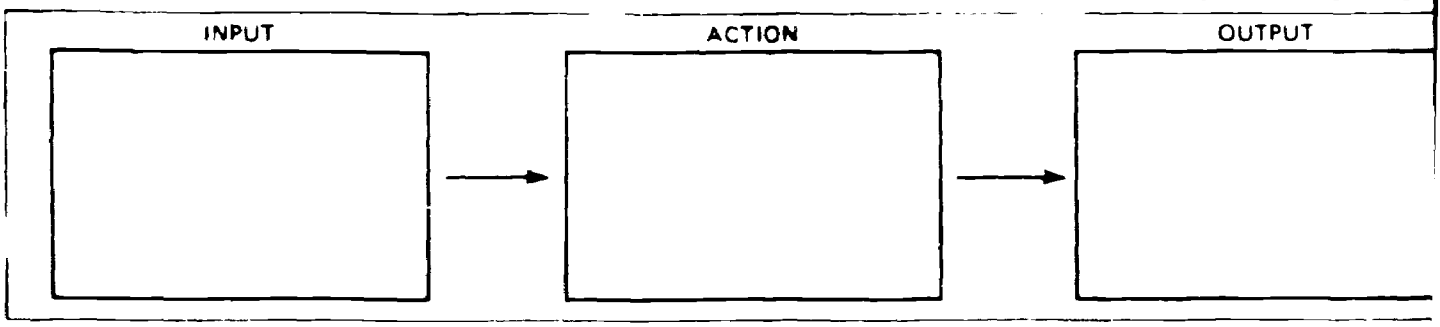
1.	Form A.5(4):	Combined Task Analysis, Learning Analysis, and Mode Analysis --A 11 x 17 folder (in yellow)
2.	Form A.5(5):	Extra Task Analysis form for each Sub-STEP --A backed-up single sheet (in yellow)
3.	Form A.5(6):	Special form for expanding information regarding input generalization --A backed-up single sheet (in yellow)
4.	Form A.5(7):	Special form for expanding information regarding action generalization --A backed-up single sheet (in yellow)

COMPETENCY ANALYSIS	c. LEARNING ANALYSIS level of difficulty in acquiring →	d. MODE ANALYSIS
INPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi med lo similarity No. of properties No. of inputs **GENERALIZATIONS** hi lo dissimilarity No. of properties No. of inputs	symbolic verbal environmental VISUAL realistic reproduced fabricated AUDIO realistic reproduced/ fabricated OTHER Kinaesthetic, smell, taste
ACTION/ CHAIN recall ☐ transfer ☐	**ASSOCIATIONS** due to ▽ hi med lo No. of associations associative strength of other actions **GENERALIZATIONS** integrative strength of action **CHAINS** hi med lo length of chain output discrimination problems associative strength of other actions	perceptual motor vocal sub/vocal recognition editing production
OUTPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi med lo similarity No. of properties No. of inputs **GENERALIZATIONS** hi med lo dissimilarity No. of properties No. of inputs	symbolic verbal environmental VISUAL realistic reproduced/ fabricated AUDIO realistic reproduced/ fabricated OTHER Kinaesthetic, smell, taste

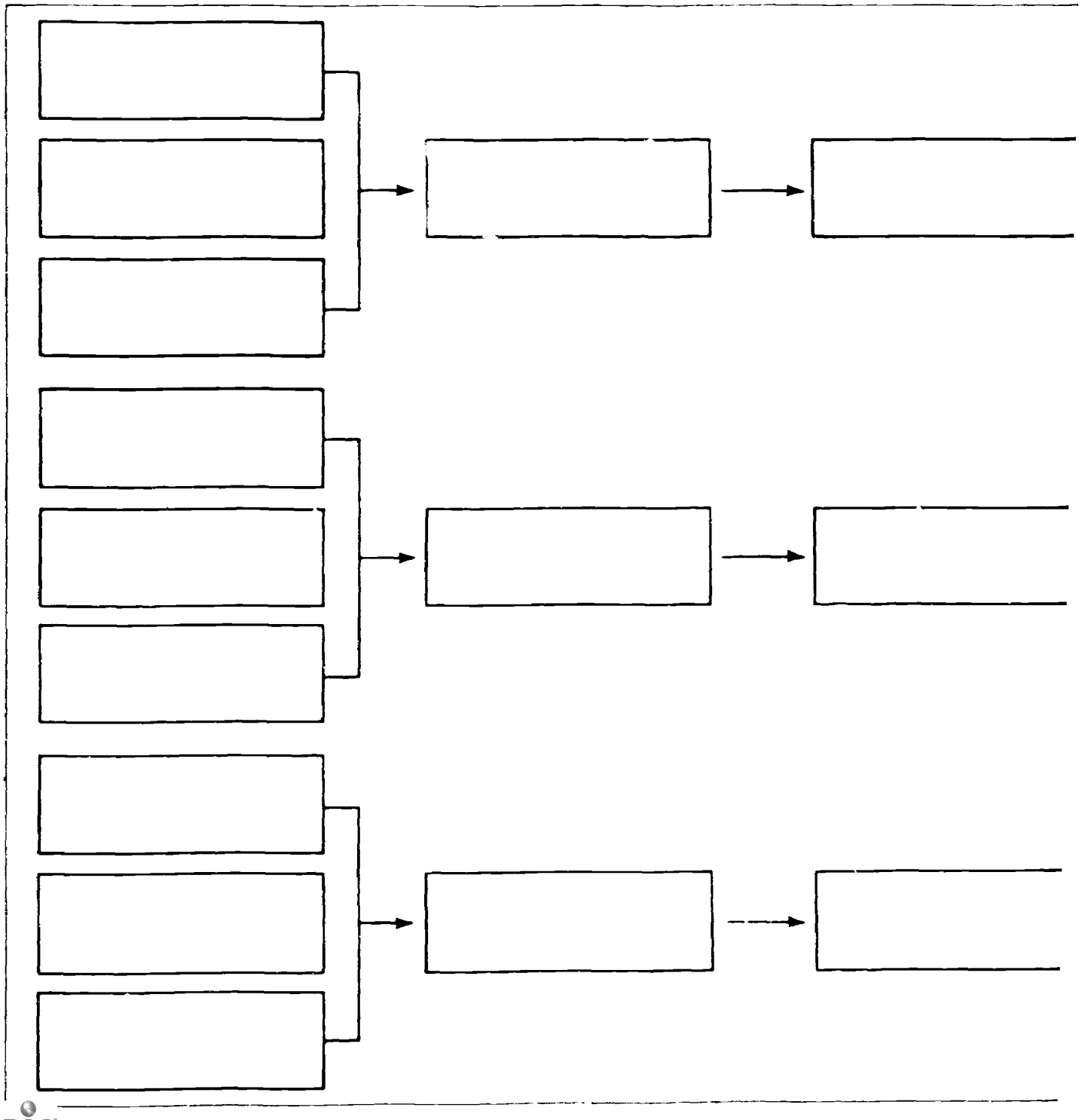
SEE NEXT TWO PAGES FOR COMPLETE FORM

Form A 5 (4)

for TASK [ ] STEP [ ] Sub-STEP [ ] a. TASK DESCRIPTION



b TASK ANALYSIS



COMPETENCY ANALYSIS	c. LEARNING ANALYSIS	d. MODE ANALYSIS

level of difficulty in acquiring

INPUT

DISCRIMINATIONS

	hi	med	lo
similarity			
No. of properties			
No. of inputs			

GENERALIZATIONS

	hi	med	lo
dissimilarity			
No. of properties			
No. of inputs			

recall ☐

transfer ☐

		symbolic	verbal	environmental
VISUAL	realistic			
	reproduced/fabricated			
AUDIO	realistic			
	reproduced/fabricated			

OTHER Kinaesthetic, smell, taste

ACTION/CHAIN

ASSOCIATIONS

	hi	med	lo
No. of associations			
associative strength of other actions			

GENERALIZATIONS

	hi	med	lo
integrative strength of action			

CHAINS

	hi	med	lo
length of chain			
output discrimination problems			
associative strength of other actions			

recall ☐

transfer ☐

	perceptual	motor	vocal	sub vocal
recognition				
editing				
action				

OUTPUT

DISCRIMINATIONS

	hi	med	lo
similarity			
No. of properties			
No. of inputs			

GENERALIZATIONS

	hi	med	lo
dissimilarity			
No. of properties			
No. of inputs			

recall ☐

transfer ☐

		symbolic	verbal	environmental
VISUAL	realistic			
	reproduced/fabricated			
AUDIO	realistic			
	reproduced/fabricated			

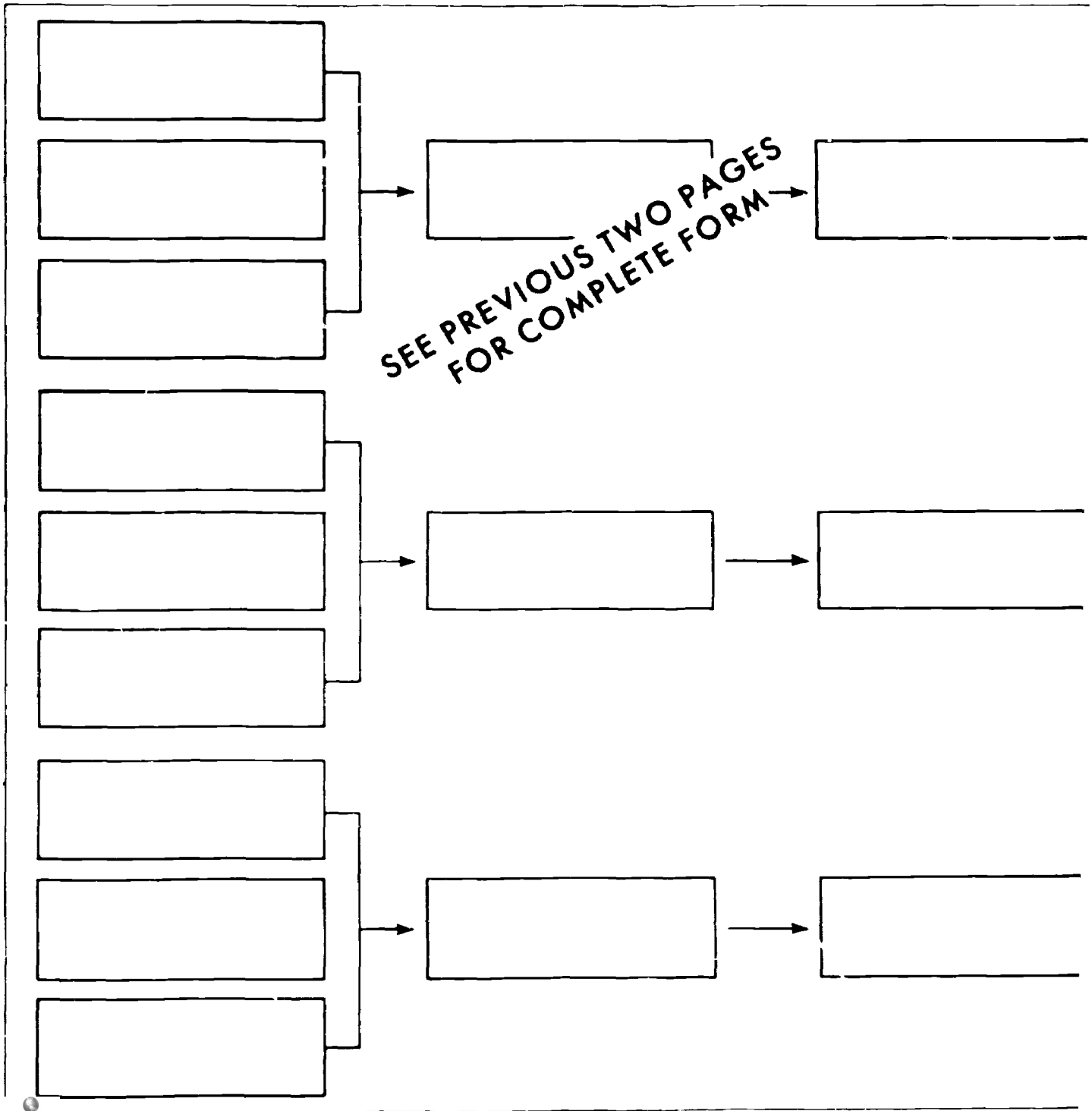
OTHER Kinaesthetic, smell, taste

Form A 5 (4)

for TASK [ ] STEP [ ] Sub-STEP [ ] a. TASK DESCRIPTION

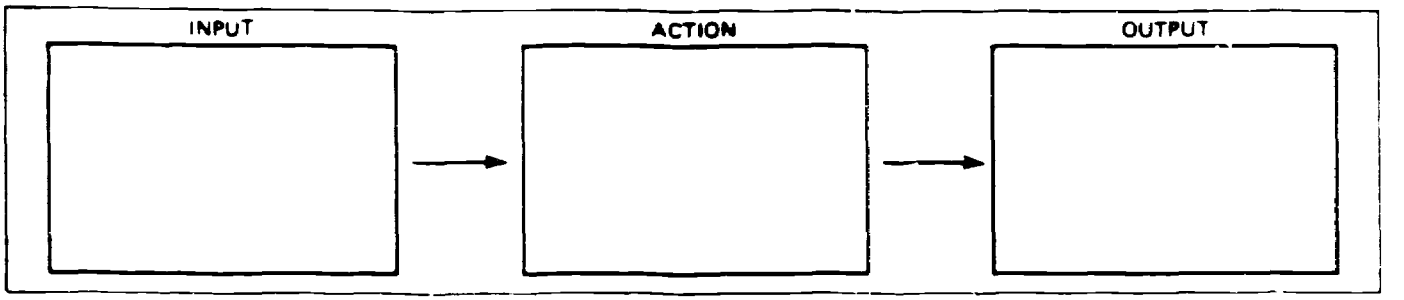
INPUT	ACTION	OUTPUT

b. TASK ANALYSIS

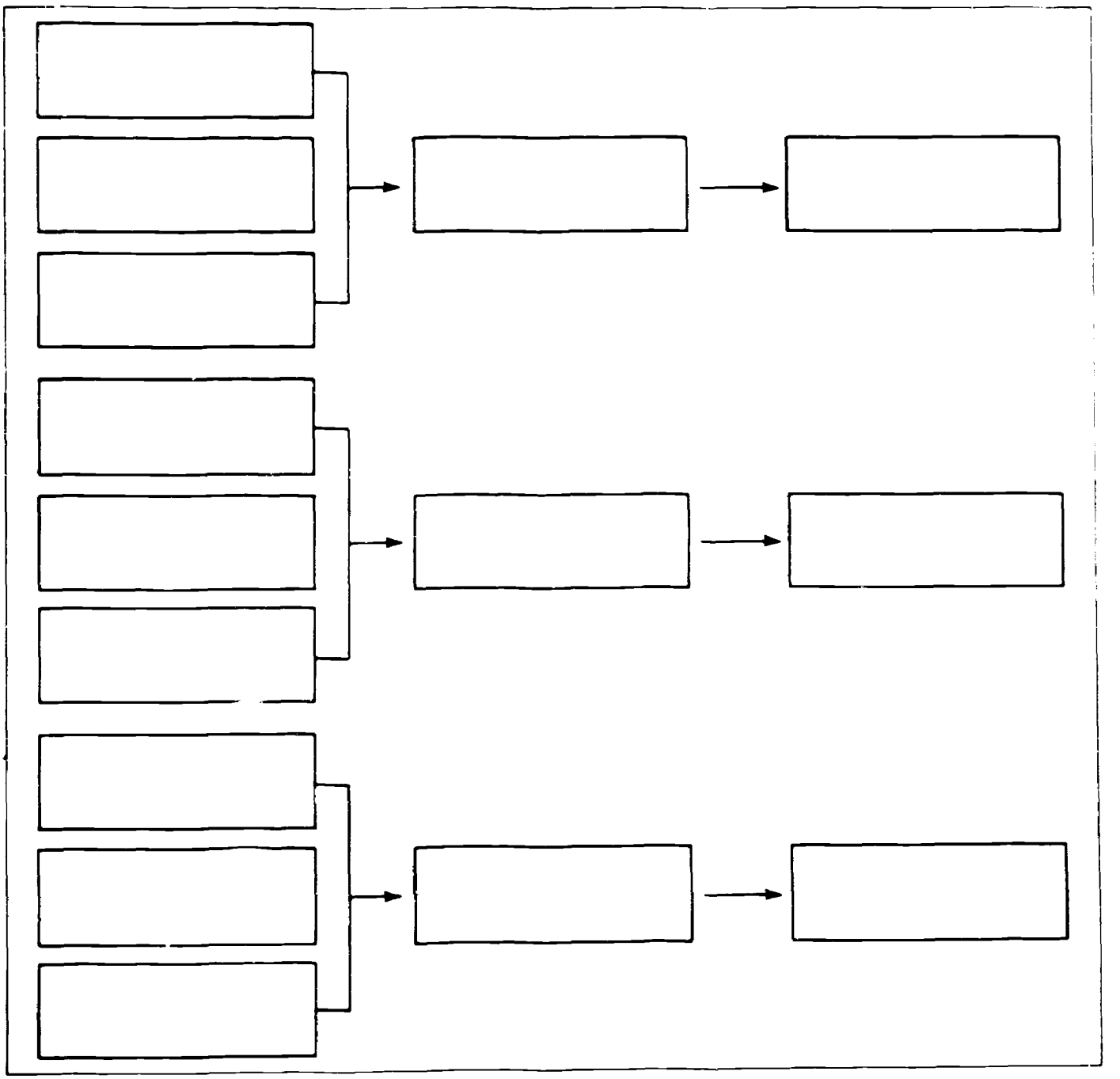


Form A 5 (5) SUPPLEMENTARY

for TASK [ ] STEP [ ] Sub-STEP [ ] a. TASK DESCRIPTION

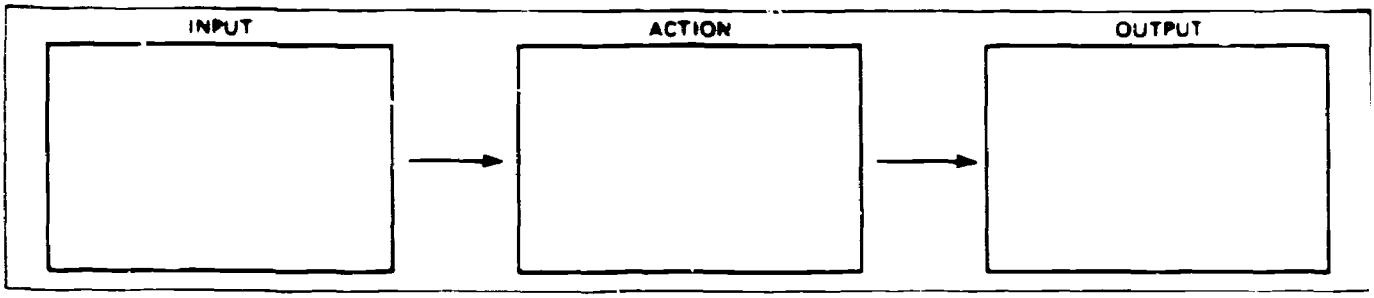


b. TASK ANALYSIS

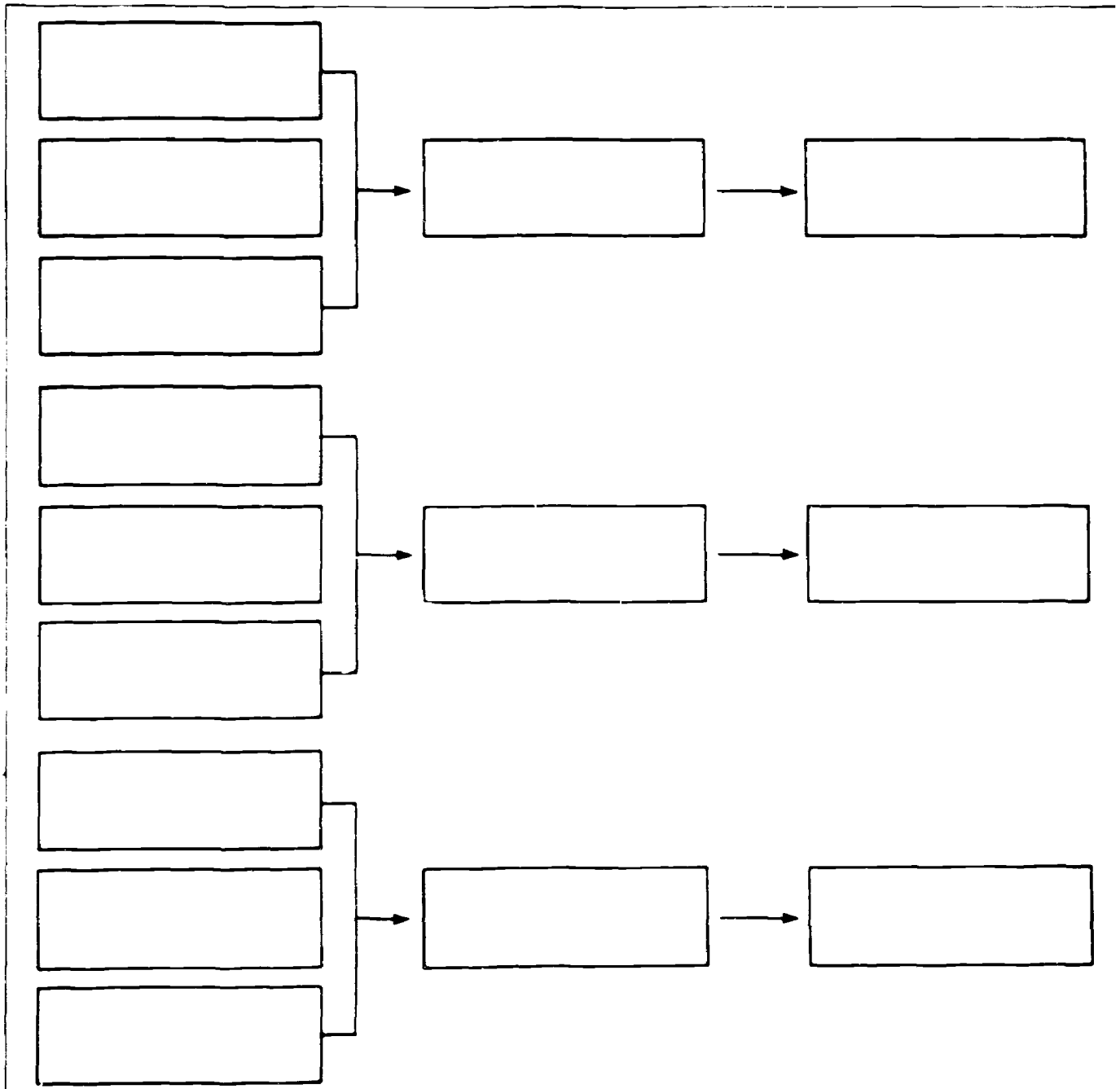


Form A 5 (5) SUPPLEMENTARY

for TASK ☐ STEP ☐ Sub-STEP ☐ a. TASK DESCRIPTION



b. TASK ANALYSIS

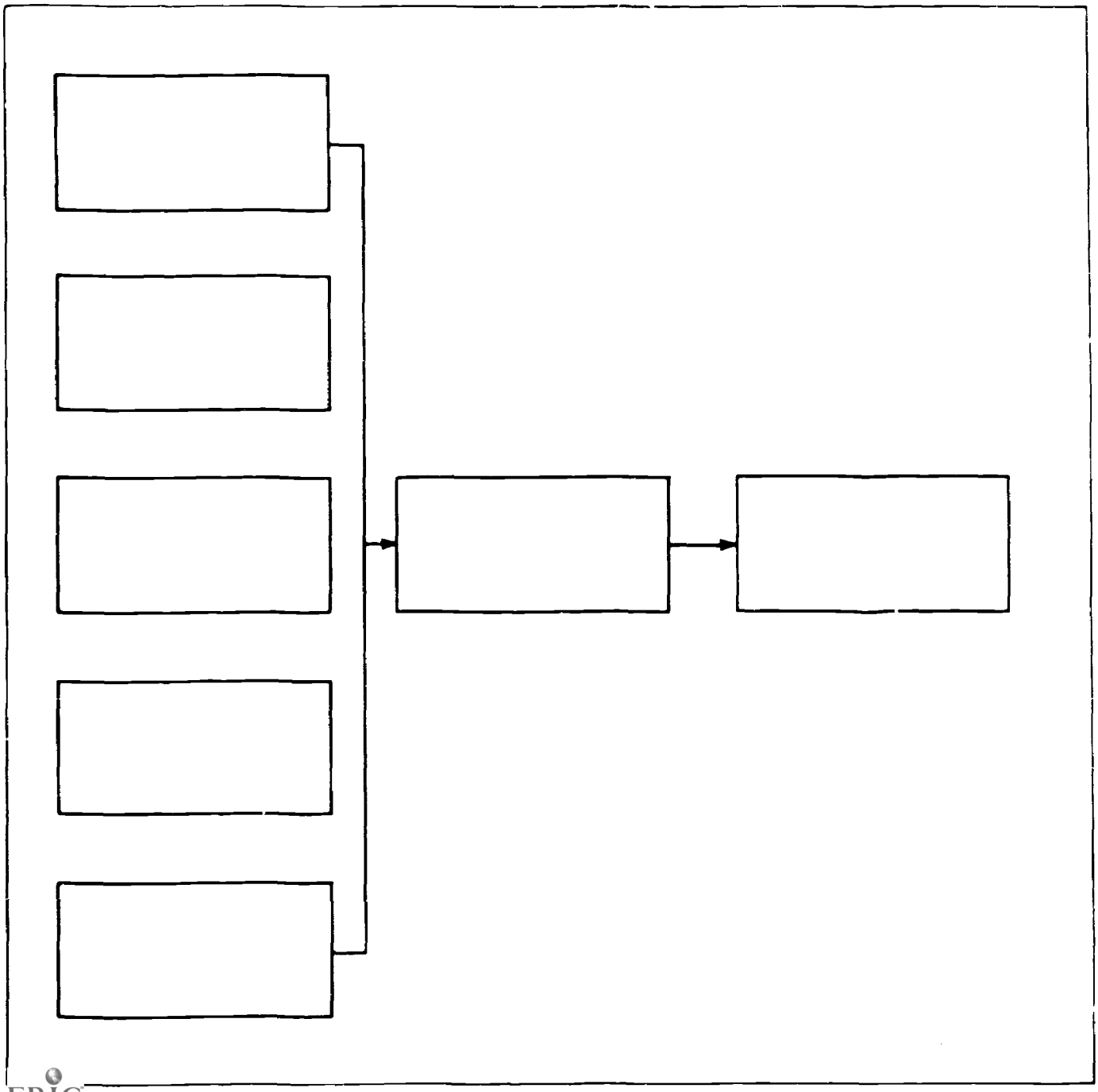


Form A-5 (6) SUPPLEMENTARY

for TASK | STEP | Sub-STEP | CELL | a. TASK DESCRIPTION

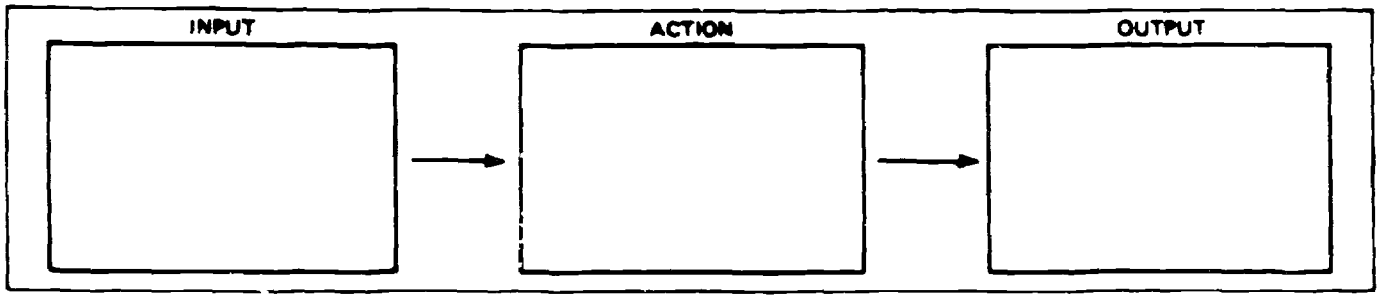
INPUT → ACTION → OUTPUT

b. TASK ANALYSIS

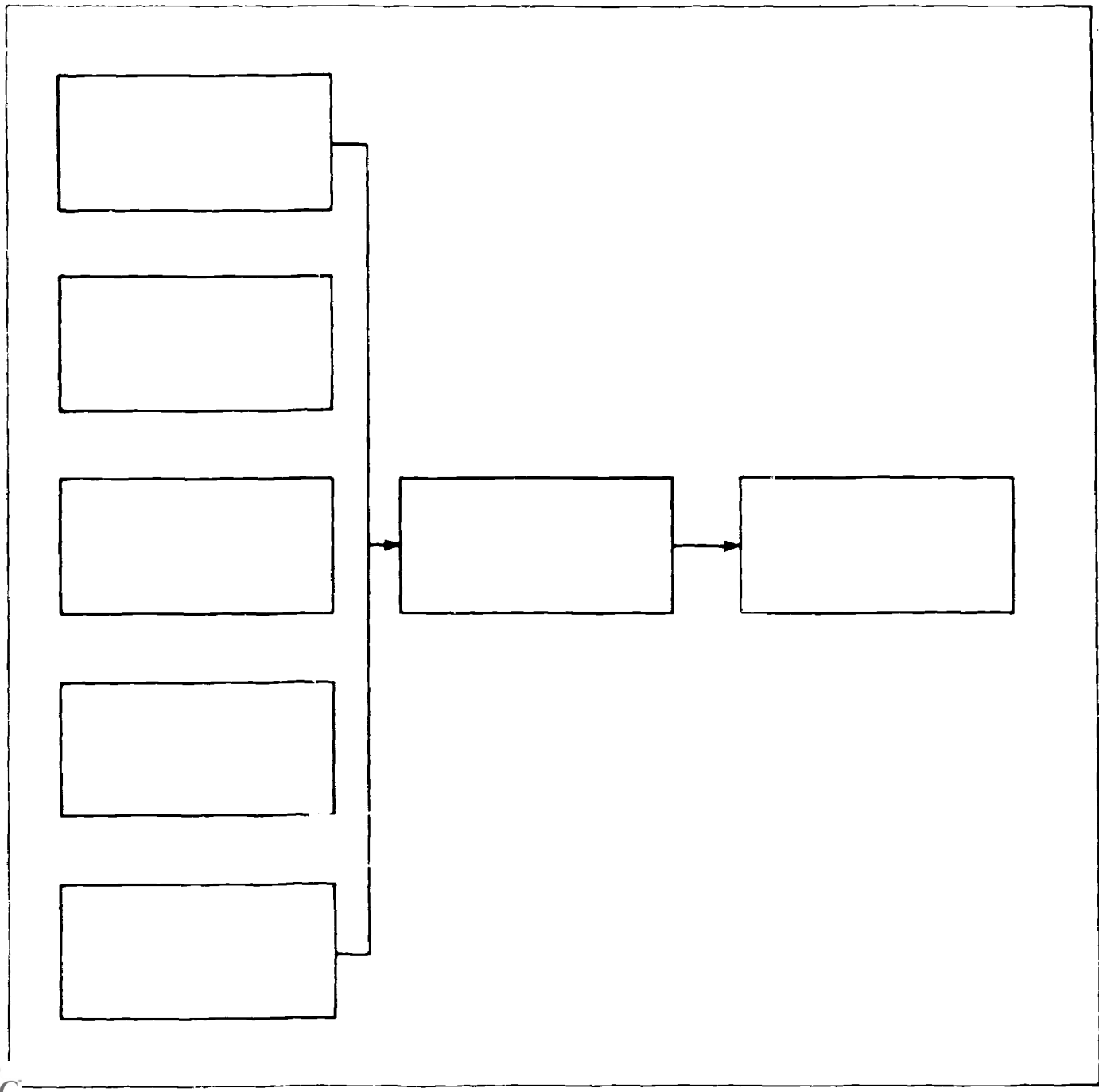


Form 3-5 (6) SUPPLEMENTARY

for TASK ☐ STEP ☐ Sub-STEP ☐ CELL ☐ a. TASK DESCRIPTION

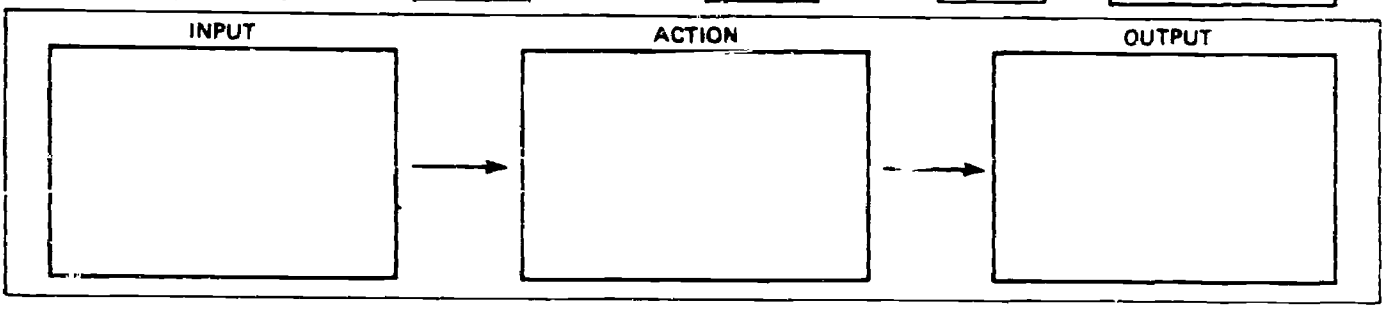


b. TASK ANALYSIS

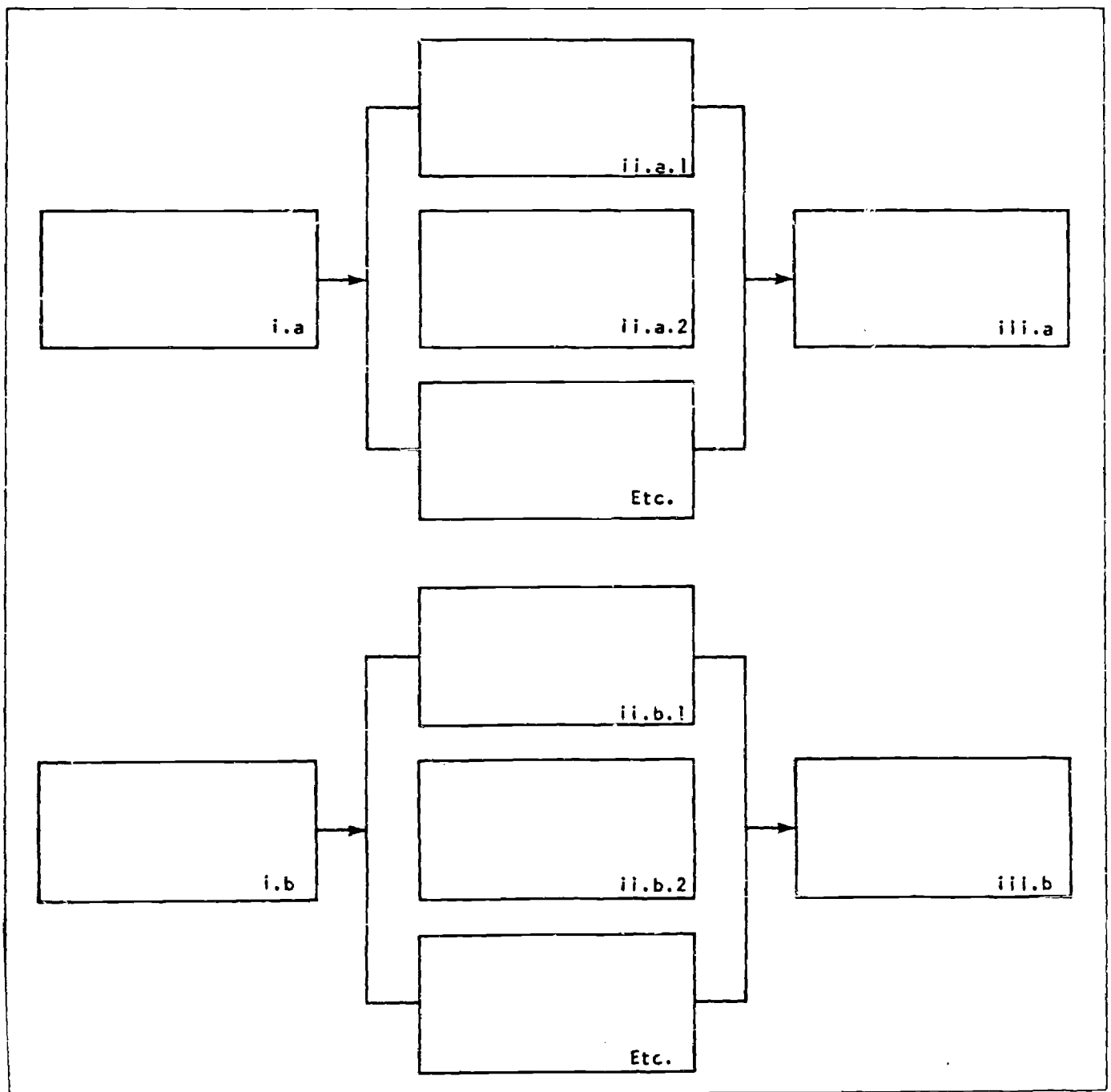


Form A-5 (7) SUPPLEMENTARY

for TASK [ ] *STEP* [ ] *Sub-STEP* [ ] *CELL* [ ] a. TASK DESCRIPTION



b. TASK ANALYSIS

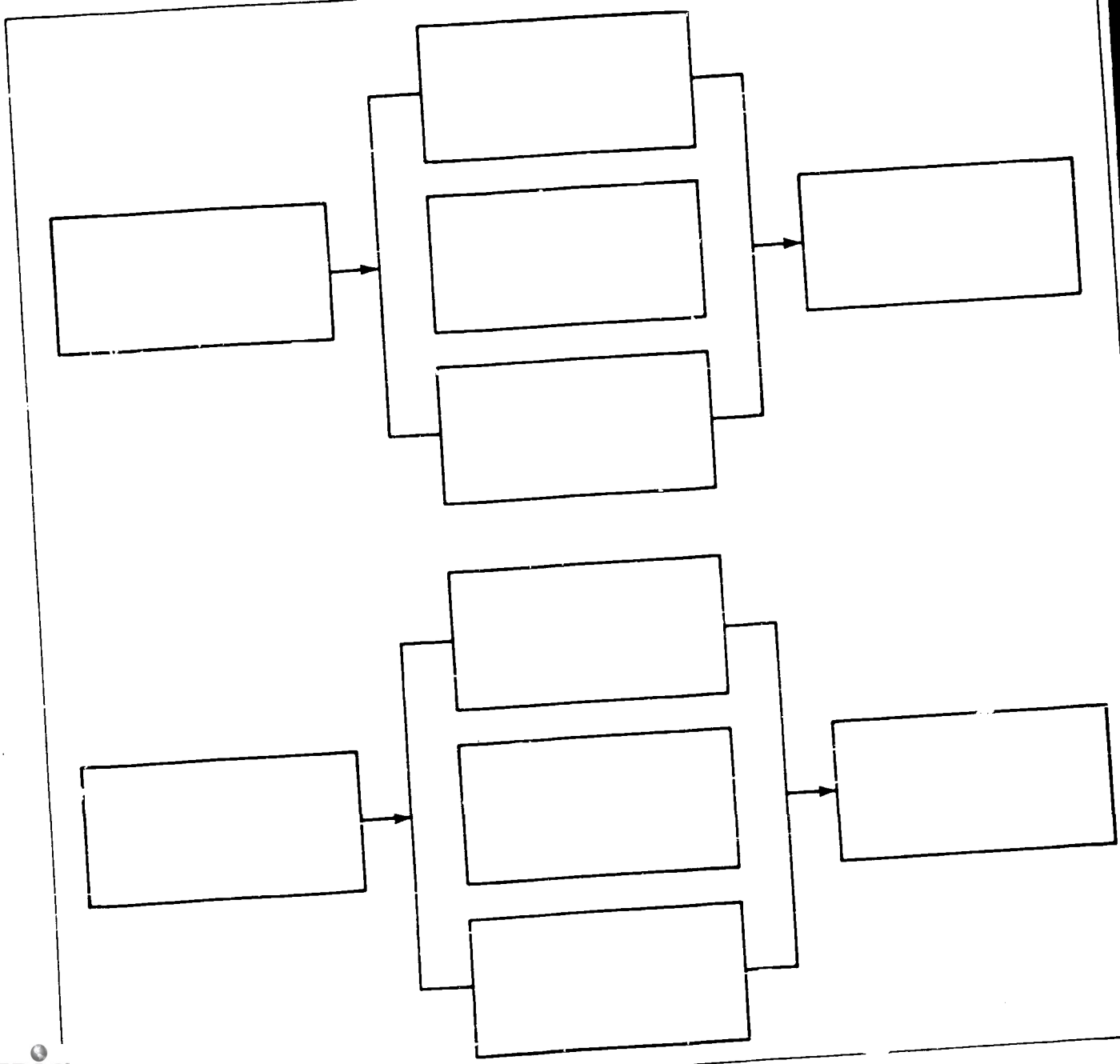


Form A-5 (7) SUPPLEMENTARY

for TASK | STEP | Sub-STEP | CELL | a. TASK DESCRIPTION

INPUT → ACTION → OUTPUT

b TASK ANALYSIS



PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*The selection of FORMS needed to describe and analyze criterion behavior which involves a knowledge domain "terminal behavior."*
WHAT YOU WILL WORK FROM	(1) Plans containing description of terminal behavior based on judgments of experts.
WHAT YOU WILL DO	(1) Select from available FORMS those necessary for describing and analyzing the criterion behavior.
FORMS YOU WILL USE	Available FORMS -- A.5(8)-(14)

DESCRIPTION OF Sub-STEP	A.5.2(b)

INPUT	ACTION	OUTPUT
Plans to describe and analyze terminal behavior in KNOWLEDGE DOMAIN based on JUDGMENTS of an EXPERT (iv)	Select appropriate forms for obtaining and recording information about terminal behavior (v)	Selection of forms for describing and analyzing terminal behavior at appropriate level of detail (vi)

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Variations in difficulty in summarizing knowledge domain 138	-MATRIX: Selection of forms appropriate to level of detail required . . . 139, 140		FORMS A.5(8)-A.5(14)

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			A.5(8)-A.5(14)
Selection of information-collecting techniques	A.2.2			

STEP A.5.2(b)

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Plans to describe and analyze terminal behavior in KNOWLEDGE DOMAIN based on JUDGMENTS of an EXPERT (iv)	Select appropriate forms for obtaining and recording information about terminal behavior (v)	Selection of forms for describing and analyzing terminal behavior at appropriate level of detail (vi

Identification of:	*Decision:*	*Selection of Forms Capable of Describing:*
Knowledge domain is relatively DIFFICULT to summarize (iv.a)	Select forms capable of describing performance at more levels of detail (v.b)	-MAJOR areas -Topics -Sub-topics -Skill elements (vi.a
Knowledge domain is relatively EASY to summarize (iv.b)	Select forms capable of describing performance at fewer levels of detail (v.b)	-Sub-topics -Skill elements (vi.b

BACKGROUND INFORMATION

A.5.2(b)

CRITERIA FOR IDENTIFYING WHETHER KNOWLEDGE DOMAIN IS LIKELY TO BE DIFFICULT OR EASY TO SUMMARIZE

IDENTIFICATION MATRIX

CRITERIA	-*Involve a relatively <u>large</u> body of knowledge* *AND* -*Various parts in the body of knowledge are integrated or interrelated (i.e., terminal behavior involves one part dependent on terminal behavior in another)*	-*Involve a relatively <u>small</u> body of knowledge* *AND* -*Various parts in the body of knowledge are <u>not</u> integrated or related (i.e., terminal behavior does <u>not</u> involve one part dependent on terminal behavior in another)*
JUDGMENT OF DIFFICULTY	Knowledge domain is relatively DIFFICULT to summarize	Knowledge domain is relatively EASY to summarize
EXAMPLES	-Physics -Chemistry -Psychology -Mathematics -Art appreciation -Philosophy -Economics -History	-Any small subdivision of the areas in the left-hand column -Rules for removing common types of household stains -Names of children in a teacher's homeroom -Description of properties of a single drug

A.5.2(b)

SELECTION OF NUMBER OR VARIETY OF FORMS BASED ON JUDGMENT OF DEGREE OF DIFFICULTY OF SUMMARIZING KNOWLEDGE DOMAIN

DECISION MATRIX

CONDITIONS	Knowledge domain is relatively DIFFICULT to summarize	Knowledge domain is relatively EASY to summarize
ACTION TO TAKE	*Select from forms to allow description at more levels of detail*	*Select from forms to allow description at fewer levels of detail*
EXAMPLES OF LEVELS OF DETAIL	EXAMPLE from PHYSICS	EXAMPLE from section of PHYSICS
Description at Level of MAJOR AREA	A. Mechanics B. Heat C. Wave Motion and Sound D. Electricity E. Electronics and Nuclear Physics F. Light	
Description at Level of TOPICS	F.1 Illumination and Velocity of Light F.2 Reflection and Refraction F.3 Lenses and the Camera F.4 Spectra F.5 Color	
Description at Level of SUB-TOPICS*	F.5.1 Wave length F.5.2 Perception of color F.5.3 Mixed colors F.5.4 Complementary colors	F.5.1 Wave length F.5.2 Perception of color F.5.3 Mixed colors F.5.4 Complementary colors

*Description can be carried out to the sub-sub-topic level when necessary.

A.5.2(b) FORMS TO USE IN DESCRIBING AND ANALYZING KNOWLEDGE DOMAINS

DECISION MATRIX

REQUIRED LEVELS OF DETAIL	FORMS TO USE	RECOMMENDED REFERENCING SYSTEM	LEVEL OF DETAIL TO BE DESCRIBED
Description of MAJOR AREAS	*Form A.5(8) Summary of AREAS*	A, B, C, D, E, etc.	Most general description
Description of MAJOR TOPICS	*Form A.5(8) Summary of TOPICS*	A.1 B.1 A.2 B.2 ⋮ ⋮ Etc. A.n B.n	Breakdown of major areas into less general topics
Description of Sub-TOPICS	*Form A.5(9) Summary of Sub-TOPICS*	A.1.1 A.2.1 A.1.2 A.2.2 ⋮ ⋮ Etc. A.1.n A.2.n	Breakdown of topics into less general sub-topics
Description of Sub-Sub-TOPICS	*Form A.5(9) Summary of Sub-TOPICS*	A.1.1(a) A.1.2(a) A.1.1(b) A.1.2(b) ⋮ ⋮ Etc. A.1.1(z) A.1.2(z)	Breakdown of sub-topics into less general sub-sub-topics
Analysis of TYPES OF TERMINAL BEHAVIOR	*Form A.5(10)*	1, 2, 3, 4, 5, 6, Etc.	Breakdown of sub-topics or of sub-sub-topics into types of terminal behavior
Analysis of SKILL ELEMENTS	*Forms A.5(11)-(14)*	i, ii, iii iv, v, vi i.a, ii.a, iii.a i.b, ii.b, iii.b i.c, ii.c, iii.c Etc.	Identification of skill elements for each type of terminal behavior

This section contains questions to be used with forms recommended for describing and analyzing knowledge domains.

CONTENTS

RECOMMENDED QUESTION FORMAT

ORIENTING STATEMENT #1

"Let's see if we can get a big picture or an overview of the major areas you think should be covered in the curriculum/training program."

QUESTION

"What are the major areas you think should be covered in _____ for _____?"
subject matter *grade level*

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean from another subject matter."*

*If possible, provide an example from the subject matter under study.

ORIENTING STATEMENT #2 *(When major areas have been identified)*

"Now, let's go back and identify the major topics within each area just listed.

QUESTION A

"What are the major (chief) topics in _____?"
AREA I

Repeat same type of question as in A until all topics within each major area have been covered.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."*

*If possible, provide an example from subject matter under study.

SPECIFIC EXAMPLES

"What are the major areas you think should be covered in *Biology* for *8th graders*?"

ILLUSTRATIVE ANTICIPATED RESULTS

A. *The Cell*

B. *The Functioning Plant*

C. *The Functioning Animal*

D. *Reproduction and Development*

E. *Genetics*

etc.

"What are the major (chief) topics in *the cell*?"

ILLUSTRATIVE ANTICIPATED RESULTS

A. THE CELL

A.1 Cell Structure

A.2 Cell Physiology

Form A-5 (8)

FOR SUMMARY OF AREAS / TOPICS

Form A 5 - 81

FOR SUMMARY OF AREAS TOPICS

A.

A.1

A.2

A.3

A.4

Etc.

B.

B.1

B.2

B.3

B.4

B.5

B.6

Etc.

A.5.2(b) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	MAJOR AREAS	TOPICS	Sub-TOPICS	Sub-Sub-TOPICS	TYPES OF COMPETENCIES	TASK ANALYSIS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers	Same as for Sub-TOPICS + Lower Case Alphabet	Arabic Numbers	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers
EXAMPLES	A B C D E F Etc.	A.1 A.2 A.3 Etc. B.1 B.2 Etc. C.1 C.2 C.3 Etc. : : Z	A.1.1 A.1.2 A.1.3 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc.	A.1.1(a) A.1.1(b) A.1.1(c) Etc. A.1.2(a) A.1.2(b) A.1.2(c) Etc. A.1.3(a) A.1.3(b) Etc. A.2.1(a) A.2.1(b) A.2.1(c) Etc. A.2.2(a) A.2.2(b) Etc.	1 2 3 4 5 Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c Etc. iv.a v.a vi.a iv.b v.b vi.b Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 Etc.

FOR SUMMARY OF Sub-TOPICS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, let's take each topic and identify the sub-topics within it."

QUESTION A.1

"What are the sub-topics treated in _____?"
Topic A.1

Repeat same type of question as in A.1 for all sub-topics within each topic previously identified.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."*

**If possible, provide an example from subject matter under study.*

SPECIFIC EXAMPLES

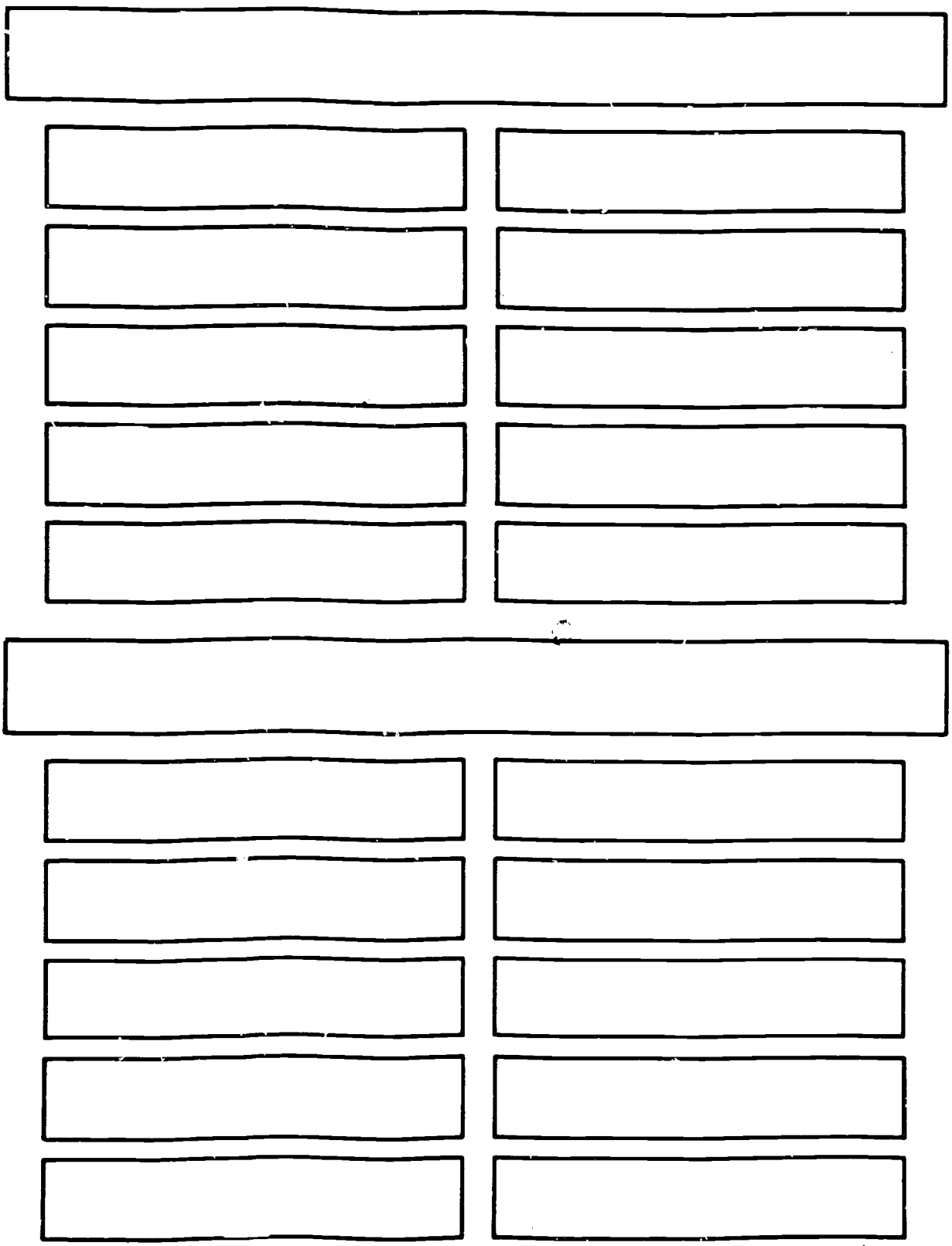
"What are the sub-topics treated under *'cell structure'*?"

ILLUSTRATIVE ANTICIPATED RESULTS

A.2 *Cell Physiology*

- A.2.1 *Entry and exit*
- A.2.2 *Diffusion*
- A.2.3 *Osmosis*
- A.2.4 *Energy*

Form A-5 (9) for AREA [ ] TOPIC [ ] FOR SUMMARY OF Sub-TOPICS



Form A-5 (9) for AREA [ ] TOPIC [ ] FOR SUMMARY OF Sub-TOPICS

A.1

A.1.1	
A.1.2	
A.1.3	
A.1.4	
Etc.	

A.2

A.2.1	A.2.6
A.2.2	Etc.
A.2.3	
A.2.4	
A.2.5	

A.5.2(b) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	MAJOR AREAS	TOPICS	Sub-TOPICS	Sub-Sub-TOPICS	TYPES OF COMPETENCIES	TASK ANALYSIS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers	Same as for Sub-TOPICS + Lower Case Alphabet	Arabic Numbers	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers
EXAMPLES	A B C D E F Etc.	A.1 A.2 A.3 Etc. B.1 B.2 Etc. C.1 C.2 C.3 Etc. : Z	A.1.1 A.1.2 A.1.3 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc.	A.1.1(a) A.1.1(b) A.1.1(c) Etc. A.1.2(a) A.1.2(b) A.1.2(c) Etc. A.1.3(a) A.1.3(b) Etc. A.2.1(a) A.2.1(b) A.2.1(c) Etc. A.2.2(a) A.2.2(b)	1 2 3 4 5 Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c Etc. iv.a v.a vi.a iv.b v.b vi.b Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 Etc.

TYPES OF COMPETENCIES

RECOMMENDED QUESTION FORMAT	SPECIFIC EXAMPLES
ORIENTING STATEMENT "Now, for each of the sub-topics (sub-sub-topics)*, let's identify the facts, concepts, principles, or terms, etc., to be covered and also identify how the learner is expected to exhibit that he has learned them. For example, after having learned a concept, will he be expected to define it verbatim or will he be expected to give an example of the concept covered during instruction or will he be expected to give a new example (one not covered during instruction). *Use the more detailed level whenever it is obtained.*	
QUESTION A.i.1 "Let's take _____ (*Sub-Topic A.1.1*). What are the terms, concepts, facts, or principles you want the learner to learn?"	"Let's take *Osmosis*. What are the terms, concepts, facts, or principles you want the learner to learn?"
QUESTION A.1.1 (Continued) "For each of the _____ (*facts, concepts, principles, etc.*) you mentioned, what kind of mastery do you expect?"	"For each of the *concepts* you mentioned, what kind of mastery do you expect?"
Repeat for all sub-topics.	

PROVIDE AN EXAMPLE WHEN NECESSARY	ILLUSTRATIVE ANTICIPATED RESULTS
STATEMENT "Here's an example of what I mean."* *If possible, provide an example from subject matter under study.*	*Osmosis* Concepts: -Membrane -Permeability -Protoplasm Principles: -How differential permeability of membrane produces osmosis Types of Terminal Behavior -Given the concept name, define it verbatim -In your own words, describe the relationship between permeability and osmosis.

Form A.5(10)

For AREA [ ] TOPIC [ ] Sub-TOPIC [ ] FOUR COMPETENCY LEVELS

IV	INPUT TRANSFER + ACTION TRANSFER new example of input [class] ⟷ new example of action/chain [class]	
III	INPUT TRANSFER + ACTION RECALL new example of input [class] ⟷ [specific] action/chain	
II	INPUT RECALL + ACTION TRANSFER [specific] input ⟷ new example of action/chain [class] old example of input [class] ⟷ new example of action/chain [class]	
I	INPUT RECALL + ACTION RECALL [specific] input ⟷ [specific] action/chain old example of input [class] ⟷ [specific] action/chain	

Form A.5(10)

For AREA [ ] TOPIC [ ] Sub-TOPIC [ ]

FOUR COMPETENCY LEVELS

IV	INPUT TRANSFER + ACTION TRANSFER new example of input [class] ⟷ new example of action/chain [class]	
III	INPUT TRANSFER + ACTION RECALL new example of input [class] → [specific] action/chain new example of input [class] ← action/chain	
II	INPUT RECALL + ACTION TRANSFER [specific] input → new example of action/chain [class] old example of input [class] ⟷ new example of action/chain [class]	
I	INPUT RECALL + ACTION RECALL [specific] input → [specific] action/chain old example of input [class] ⟷ [specific] action/chain	

A.5.2(b) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	MAJOR AREAS	TOPICS	Sub-TOPICS	Sub-Sub-TOPICS	TYPES OF COMPETENCIES	TASK ANALYSIS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers	Same as for Sub-TOPICS + Lower Case Alphabet	Arabic Numbers	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers
EXAMPLES	A B C D E F Etc.	A.1 A.2 A.3 Etc. B.1 B.2 Etc. C.1 C.2 C.3 Etc. : Z	A.1.1 A.1.2 A.1.3 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc.	A.1.1(a) A.1.1(b) A.1.1(c) Etc. A.1.2(a) A.1.2(b) A.1.2(c) Etc. A.1.3(a) A.1.3(b) Etc. A.2.1(a) A.2.1(b) A.2.1(c) Etc. A.2.2(a) A.2.2(b) Etc.	1 2 3 4 5 Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c Etc. iv.a v.a vi.a iv.b v.b vi.b Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 Etc.

RECOMMENDED QUESTION FORMAT

ORIENTING STATEMENT

"Now we want to get specific detail about the content and terminal behavior expected for each _____ (*fact, concept, principle, etc.*) you just identified."

QUESTION #1

"Let's take _____ (*fact, concept, principle, etc.*). What will the learner be given (INPUT) when you test him? What will he be expected to do (ACTION)? What will the OUTPUT consist of?"

QUESTION #2 (Discriminations)

"Let's take the INPUT you mentioned. From what other different type(s) of INPUTS does the learner have to discriminate it?"

QUESTION #3 (Associations/Chains)

"For each INPUT you identified, what action does the learner have to take?"

QUESTION #4 (INPUT Generalization)

"For each INPUT, are there possible variations that nevertheless require the learner to take the same ACTION?"

QUESTION #5 (ACTION Generalization)

"Let's take each of these ACTIONS. Is there an alternative form it can take?"

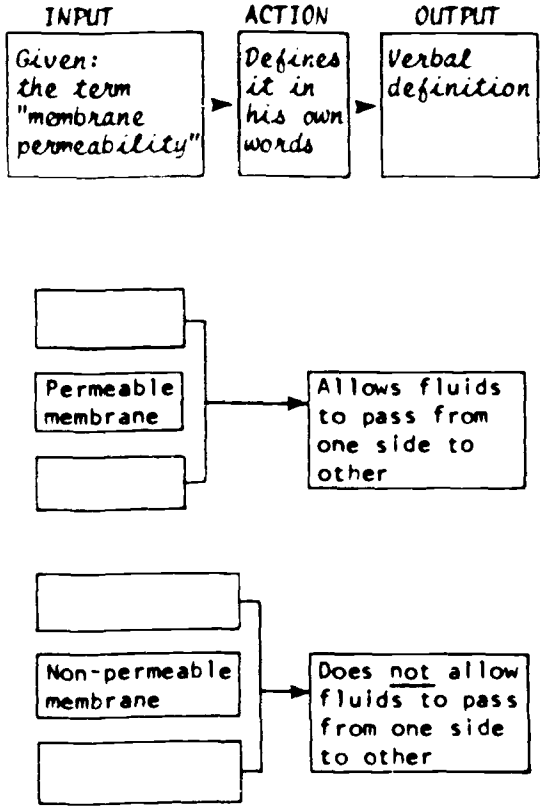
QUESTION #6 (Discriminations - Outputs)

"For each INPUT, is there a different outcome? What?"

SPECIFIC EXAMPLES

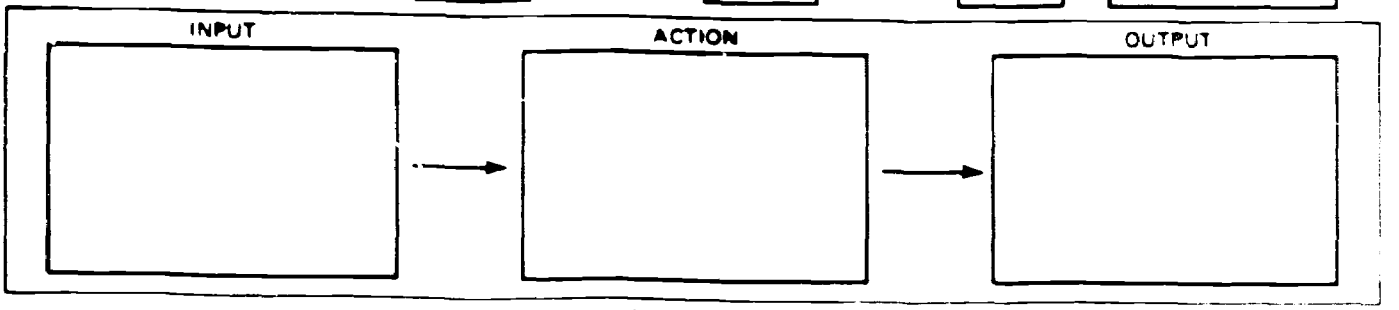
"Let's take *the concept of membrane permeability*."

ILLUSTRATIVE ANTICIPATED RESULTS

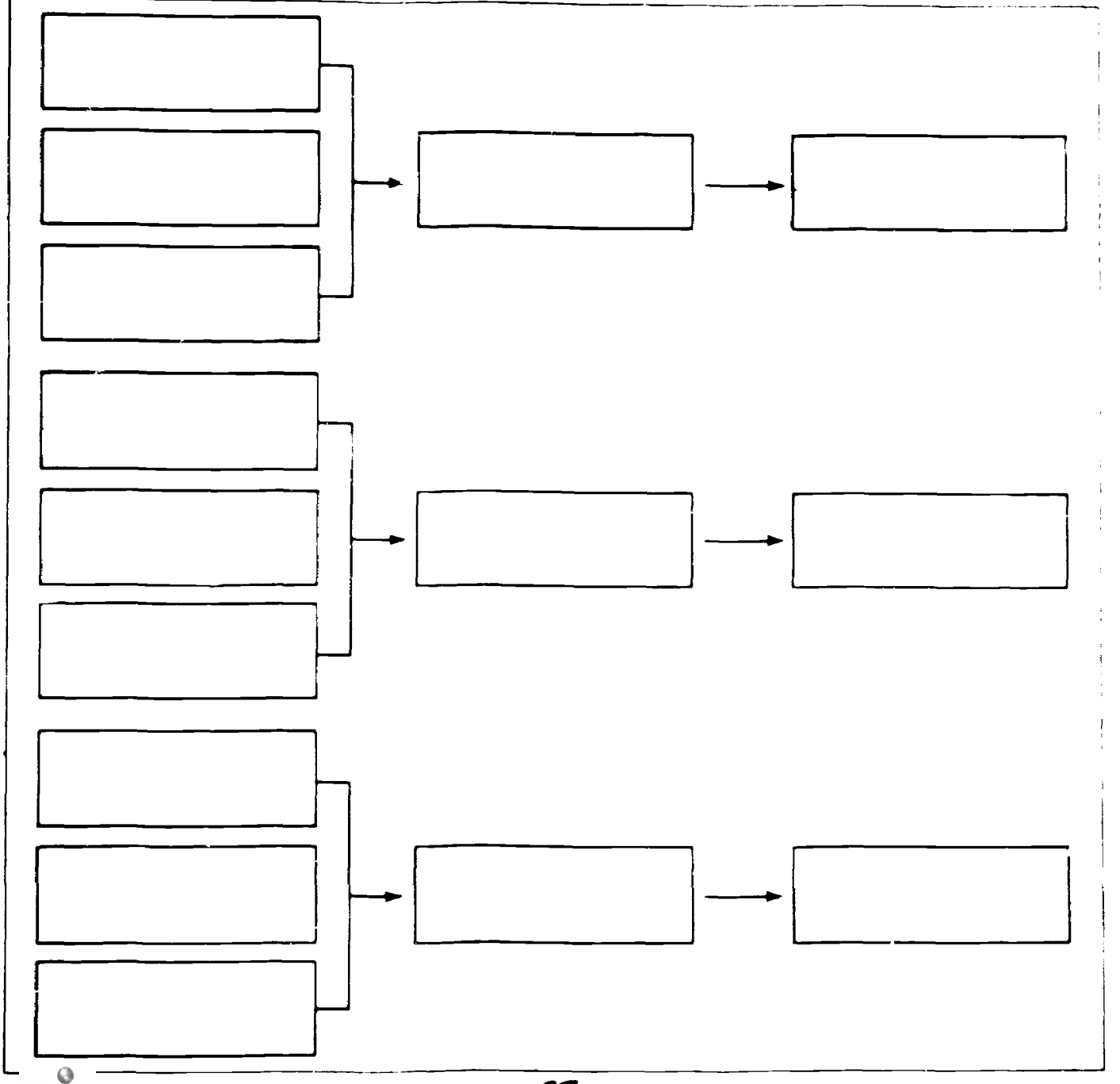


Form A-5 (11)

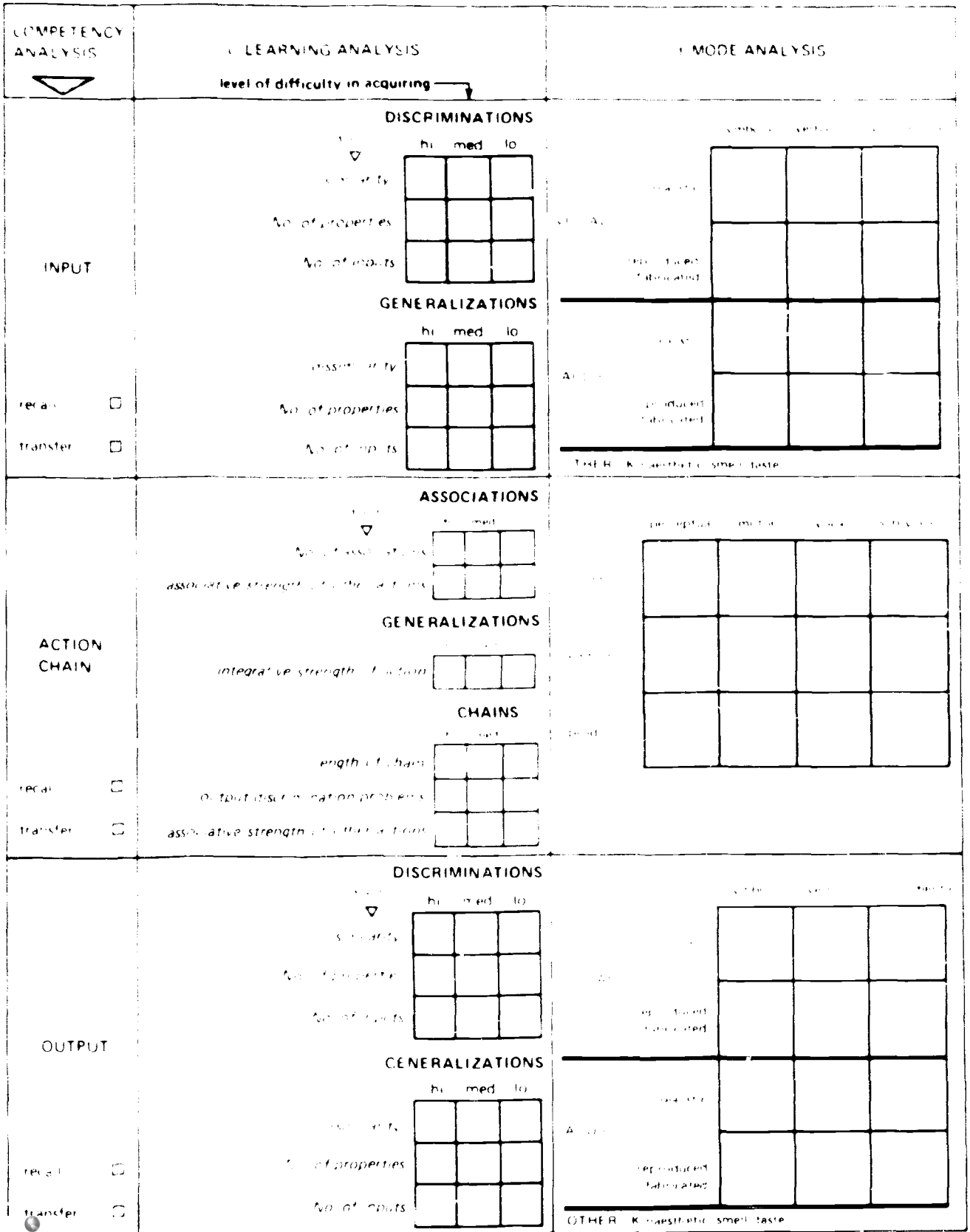
for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION



b. TASK ANALYSIS

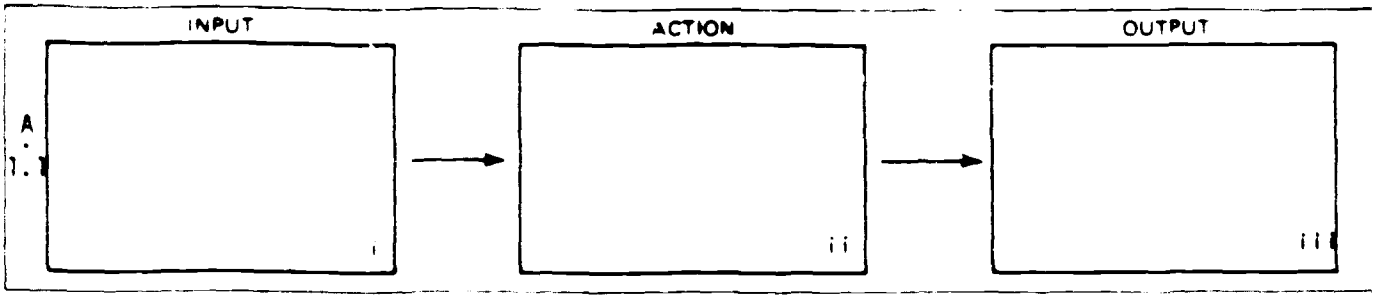


RECOMMENDED QUESTION FORMATS	SPECIFIC EXAMPLES
ORIENTING STATEMENT "Let's analyze the difficulties in learning the skills in learning this _____." *fact, concept, principle*	
QUESTION 1 (Re: Discriminations) "Is it difficult to tell the difference between _____?" *input conditions* "Is this difficulty due to the fact that the _____ are highly similar?" *input conditions* "What properties of the _____ do you have to pay attention to in order to see the difference?" *input conditions*	**QUESTION 1** "Is it difficult to tell the difference between *the terms permeable and non-permeable*?
QUESTION 2 (Re: Generalizations) "Within each type of _____ is it difficult to see the similarities (ignore the differences if present)?" *input condition* "Is this due to a high degree of dissimilarity among _____?" *input conditions* "What properties of the _____ do you have to pay attention to in order to see the similarities?" *input conditions*	
QUESTION 3 (Re: Associations/Chains) "For any of these _____, is there an existing action people now perform very often? What?" *input conditions*	**QUESTION 3** "For either of these *two terms: permeable and non-permeable*, is there a definition people usually offer?"
QUESTION 4 (Re: Outputs) *Repeat same type of questions as for inputs.*	

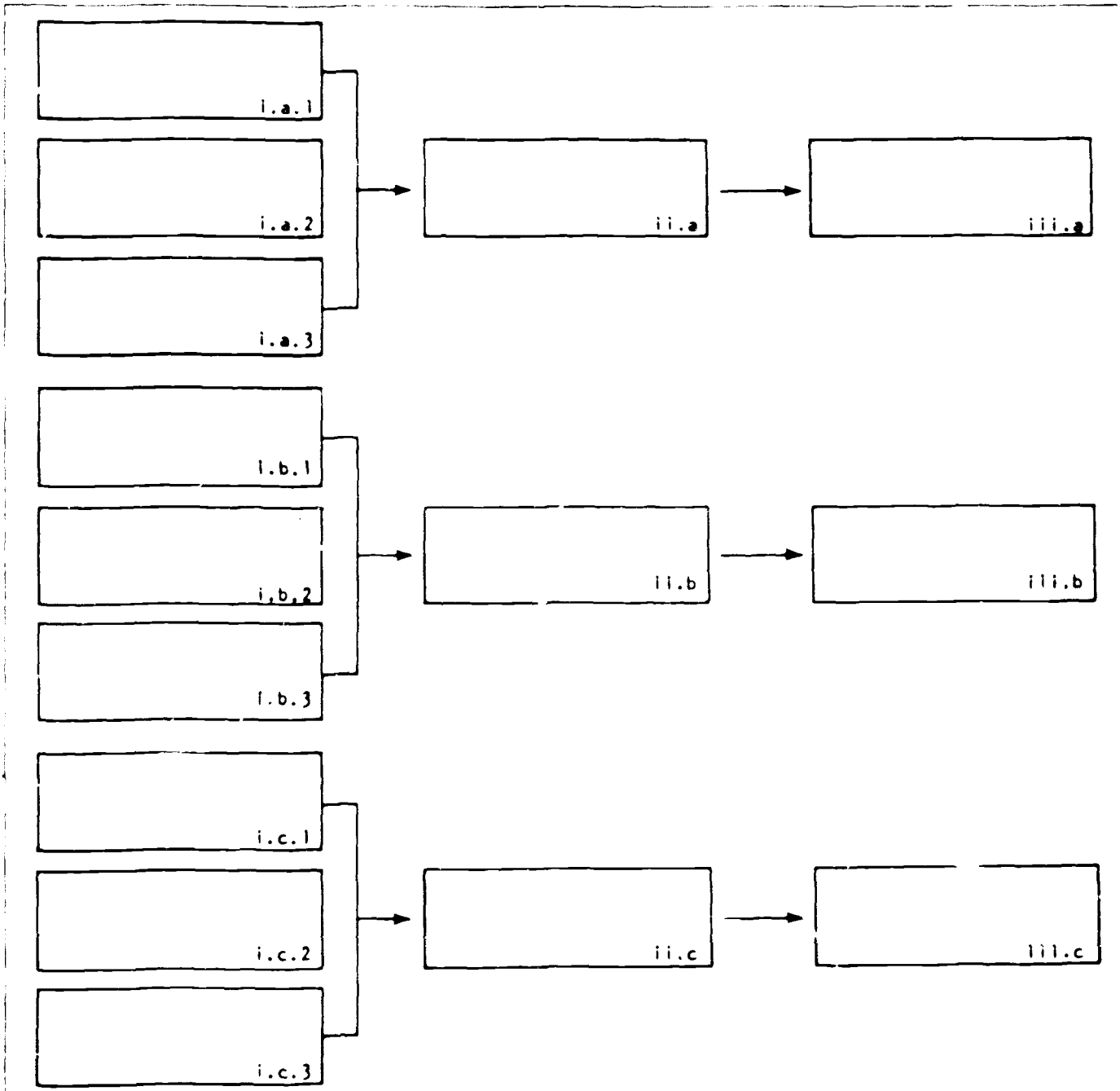

COMPETENCY ANALYSIS
LEARNING ANALYSIS
level of difficulty in acquiring
MODE ANALYSIS
INPUT
DISCRIMINATIONS
hi med lo
No. of properties
No. of units
GENERALIZATIONS
hi med lo
No. of properties
recall
transfer
ACTION CHAIN
ASSOCIATIONS
med
GENERALIZATIONS
CHAINS
recall
transfer
OUTPUT
DISCRIMINATIONS
hi med lo
No. of properties
No. of units
GENERALIZATIONS
hi med lo
No. of properties
No. of units
recall
transfer
OTHER

Form A 5 (4)

for AREA [A] TOPIC [1] SUB TOPIC [1] CONTENT ITEM [22] a. TASK DESCRIPTION



b TASK ANALYSIS



A.5.2(b) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	MAJOR AREAS	TOPICS	Sub-TOPICS	Sub-Sub-TOPICS	TYPES OF COMPETENCIES	TASK ANALYSIS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers	Same as for Sub-TOPICS + Lower Case Alphabet	Arabic Numbers	Lower Case Roman Numbers + Lower Case Alphabet + Arabic Numbers
EXAMPLES	A B C D E F Etc.	A.1 A.2 A.3 Etc. B.1 B.2 Etc. C.1 C.2 C.3 Etc. : : Z	A.1.1 A.1.2 A.1.3 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc.	A.1.1(a) A.1.1(b) A.1.1(c) Etc. A.1.2(a) A.1.2(b) A.1.2(c) Etc. A.1.3(a) A.1.3(b) Etc. A.2.1(a) A.2.1(b) A.2.1(c) Etc. A.2.2(a) A.2.2(b) Etc.	1 2 3 4 5 Etc.	i.a ii.a iii.a i.b ii.b iii.b i.c ii.c iii.c Etc. iv.a v.a vi.a iv.b v.b vi.b Etc. + i.a.1 i.a.2 i.b.1 i.b.2 i.b.3 i.c.1 i.c.2 Etc

ACTUAL FORMS

1.	Form A.5(11):	Combined Task Analysis, Learning Analysis, and Mode Analysis --A 11 x 17 folder (in yellow)
2.	Form A.5(12):	Extra Task Analysis form for each Sub-STEP --A backed-up single sheet (in yellow)
3.	Form A.5(13):	Special form for expanding information regarding input generalization --A backed-up single sheet (in yellow)
4.	Form A.5(14):	Special form for expanding information regarding action generalization --A backed-up single sheet (in yellow)

COMPETENCY ANALYSIS	c. LEARNING ANALYSIS level of difficulty in acquiring →	d. MODE ANALYSIS
INPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi med lo *similarity* *No. of properties* *No. of inputs* **GENERALIZATIONS** hi med lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic verbal environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER Kinaesthetic, smell, taste
ACTION/ CHAIN recall ☐ transfer ☐	**ASSOCIATIONS** due to ▽ hi med lo *No. of associations* *associative strength of other actions* **GENERALIZATIONS** hi med lo *integrative strength of action* **CHAINS** hi med lo *length of chain* *output discrimination problems* *associative strength of other actions*	perceptual motor vocal sub-vocal recognition editing production
OUTPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi med lo *similarity* *No. of properties* *No. of inputs* **GENERALIZATIONS** hi med lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic verbal environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER Kinaesthetic, smell, taste

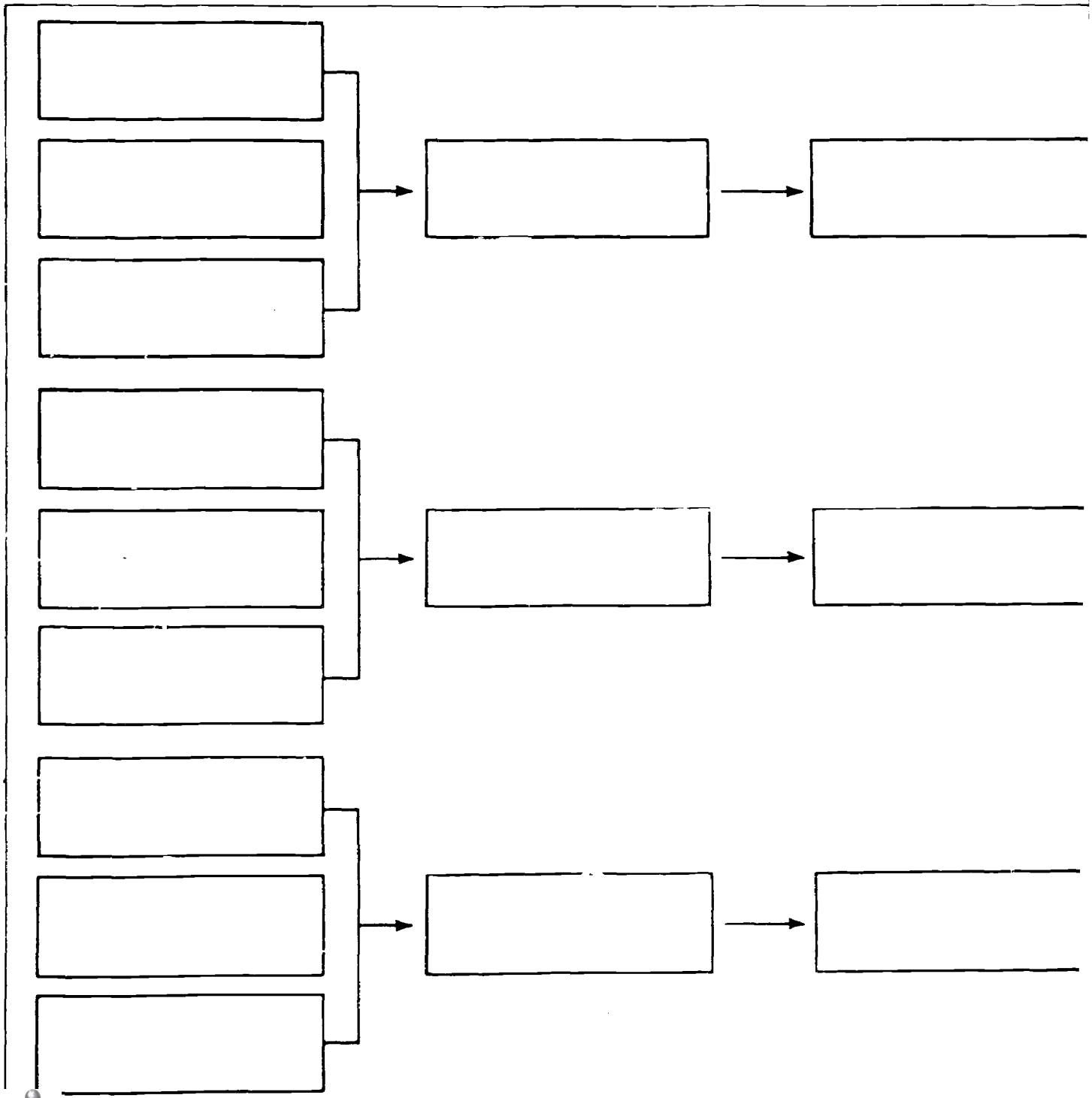
SEE NEXT TWO PAGES FOR COMPLETE FORM

Form A-5 (11)

for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION

INPUT → ACTION → OUTPUT

b. TASK ANALYSIS



COMPETENCY ANALYSIS ▽	c. LEARNING ANALYSIS level of difficulty in acquiring →	d. MODE ANALYSIS
INPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi / med / lo *similarity* *No. of properties* *No. of inputs* **GENERALIZATIONS** hi / med / lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic / verbal / environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER: Kinaesthetic, smell, taste
ACTION/ CHAIN recall ☐ transfer ☐	**ASSOCIATIONS** due to ▽ hi / med / lo *No. of associations* *associative strength of other actions* **GENERALIZATIONS** hi / med / lo *integrative strength of action* **CHAINS** hi / med / lo *length of chain* *output discrimination problems* *associative strength of other actions*	perceptual / motor / vocal / sub/vocal recognition editing production
OUTPUT recall ☐ transfer ☐	**DISCRIMINATIONS** due to ▽ hi / med / lo *similarity* *No. of properties* *No. of inputs* **GENERALIZATIONS** hi / med / lo *dissimilarity* *No. of properties* *No. of inputs*	symbolic / verbal / environmental VISUAL: realistic; reproduced/fabricated AUDIO: realistic; reproduced/fabricated OTHER: Kinaesthetic, smell, taste

Form A-5 (11)

for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTIO

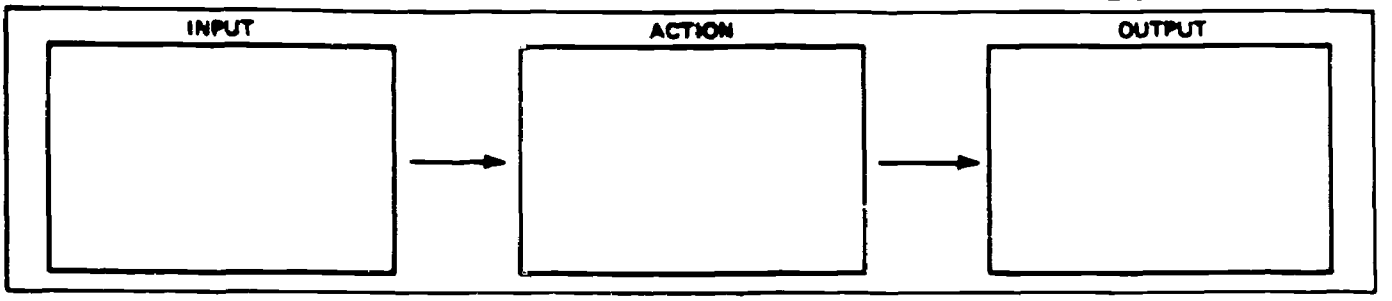
INPUT → ACTION → OUTPUT

b. TASK ANALYSIS

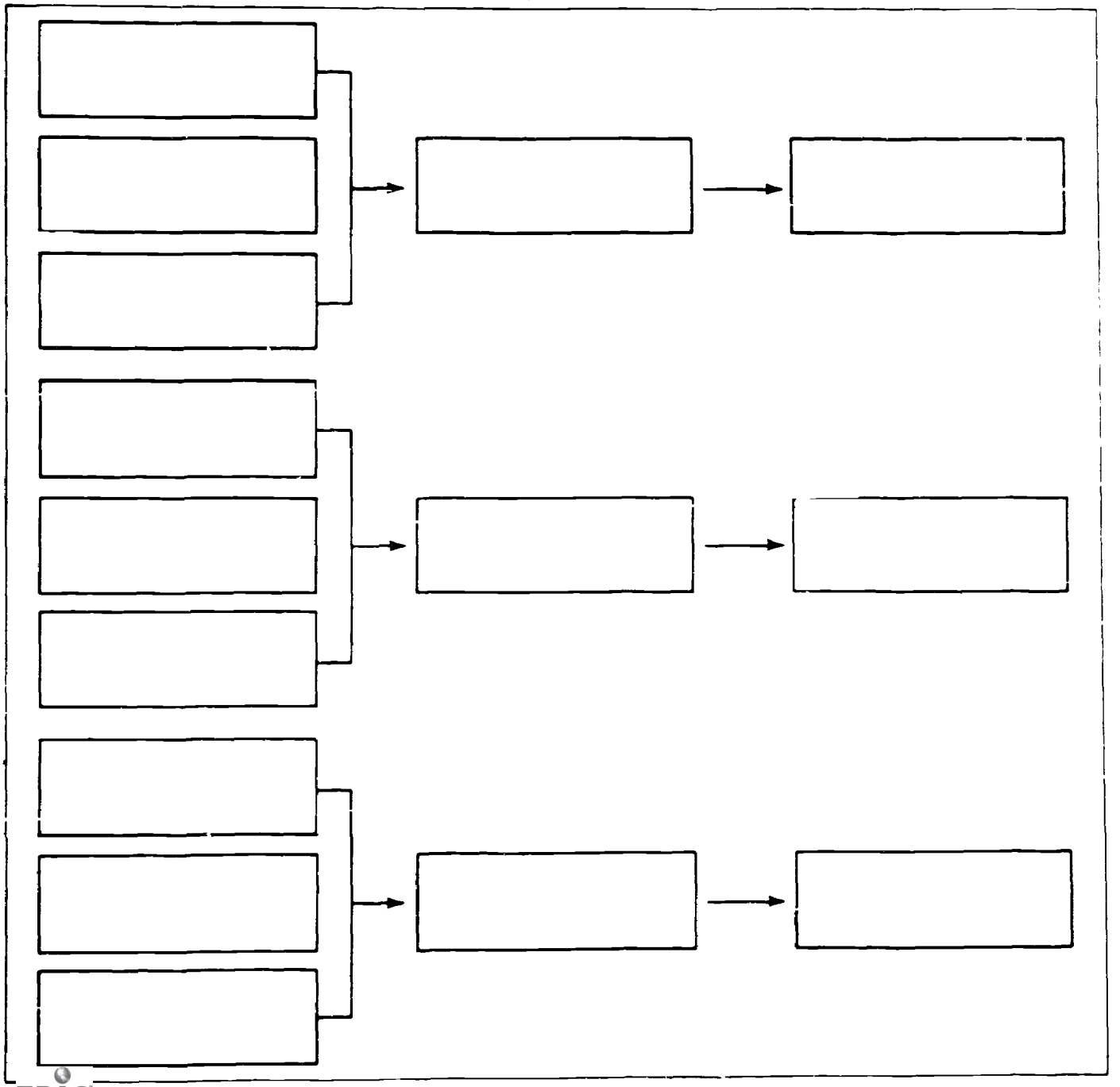
SEE PREVIOUS TWO PAGES FOR COMPLETE FORM

Form A.5(12) SUPPLEMENTARY

for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION

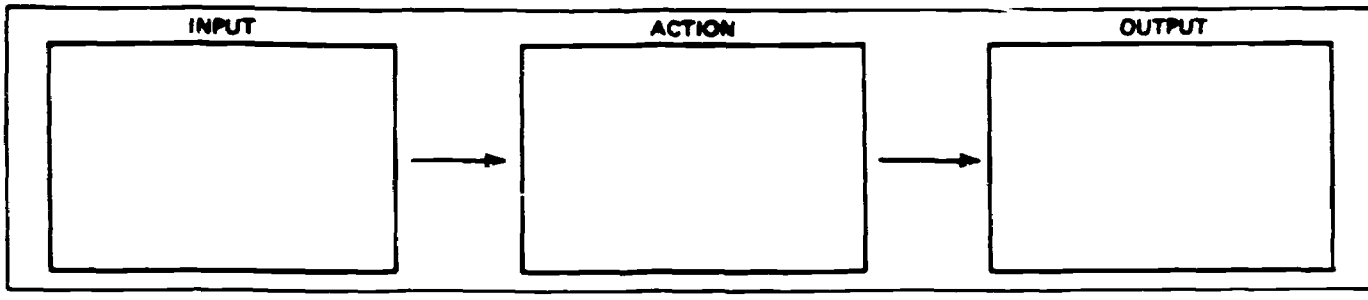


b. TASK ANALYSIS

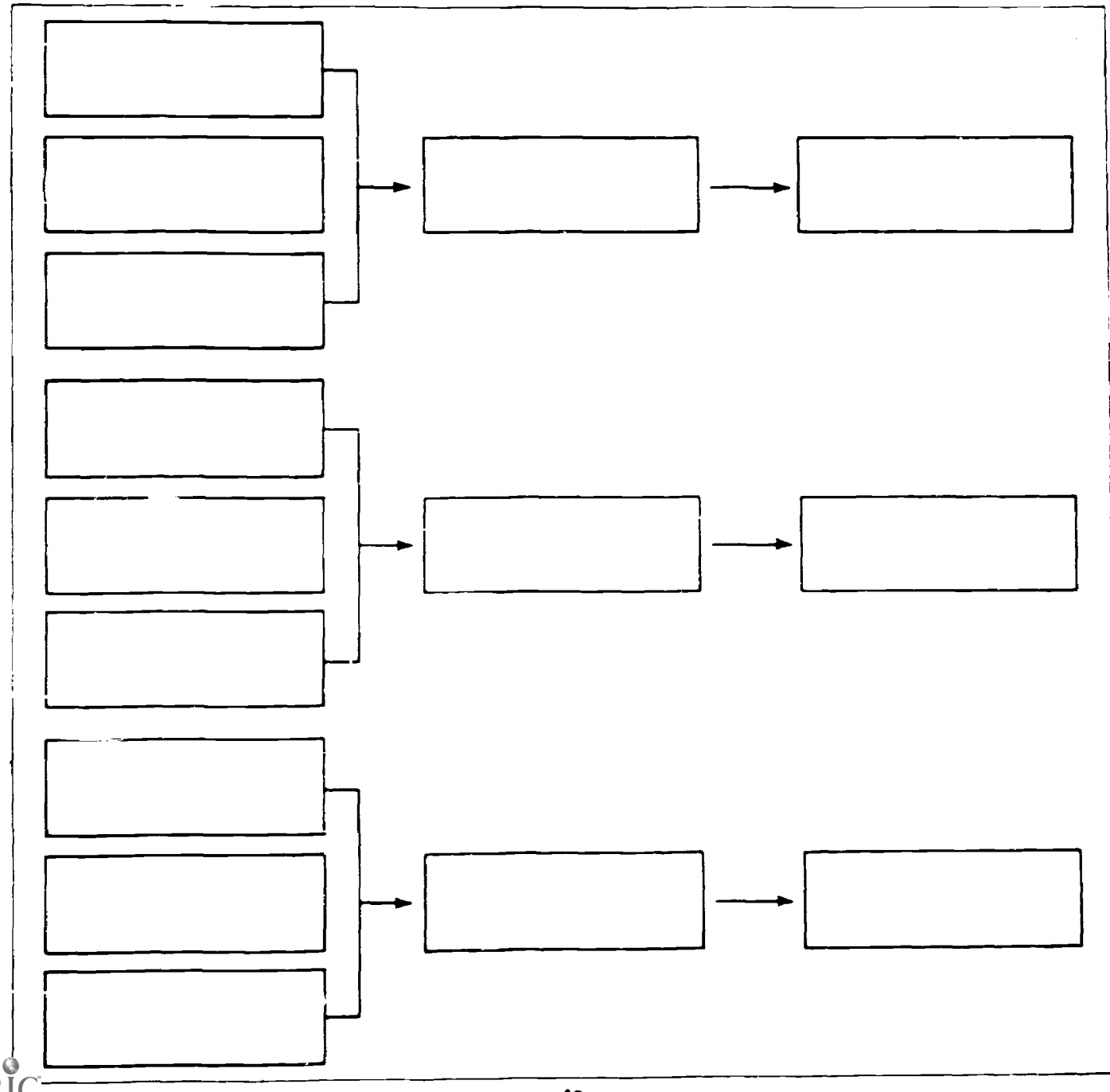


Form A.5(12) SUPPLEMENTARY

for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION

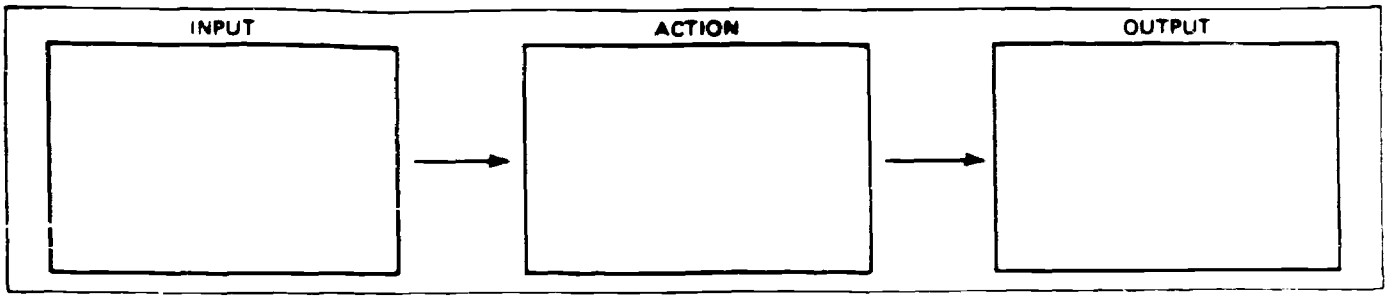


b. TASK ANALYSIS

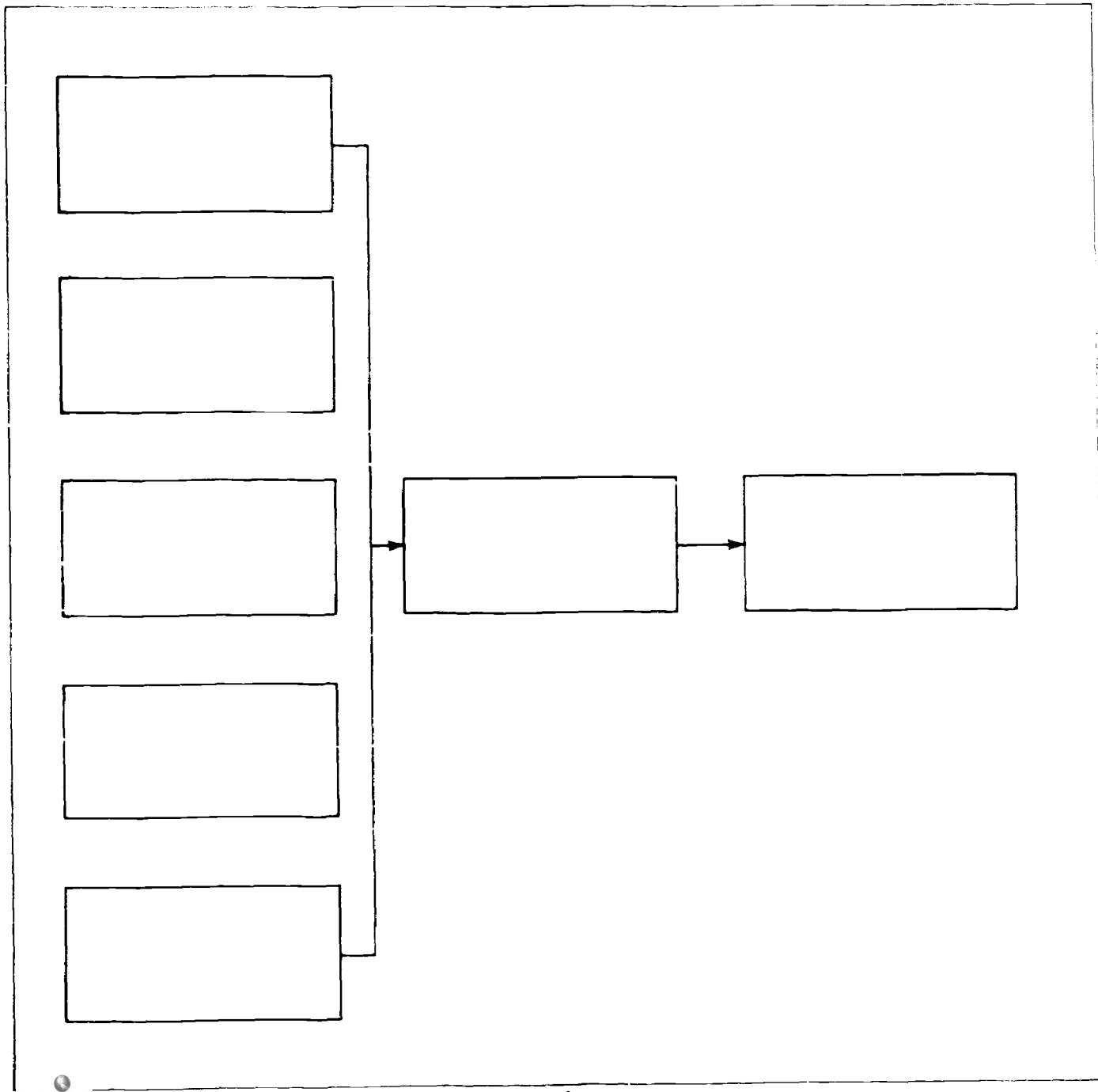


Form A 5 (13) SUPPLEMENTARY

for AREA | TASK | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION

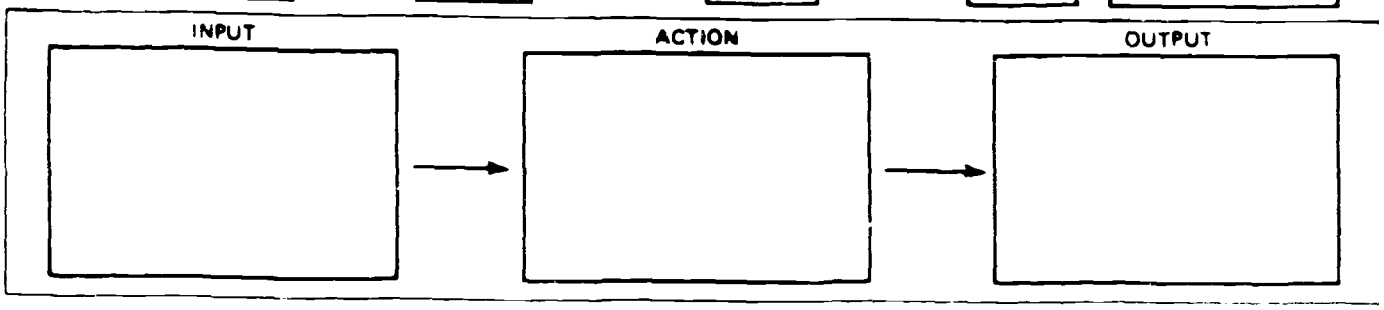


b. TASK ANALYSIS

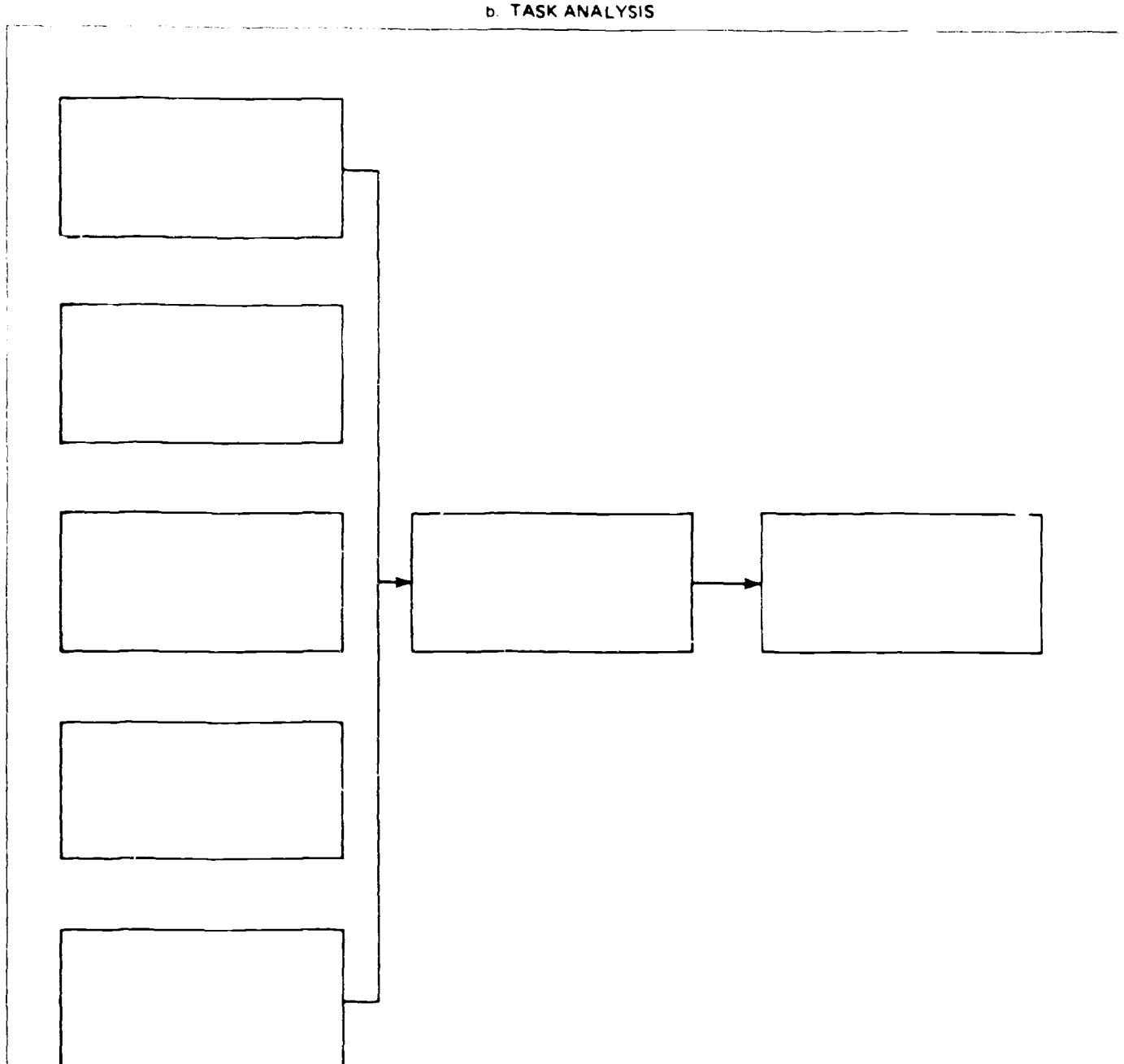


Form A-5 (13) SUPPLEMENTARY

for AREA [ ] TASK [ ] SUB-TOPIC [ ] BEHAVIOR [ ] a. TASK DESCRIPTION

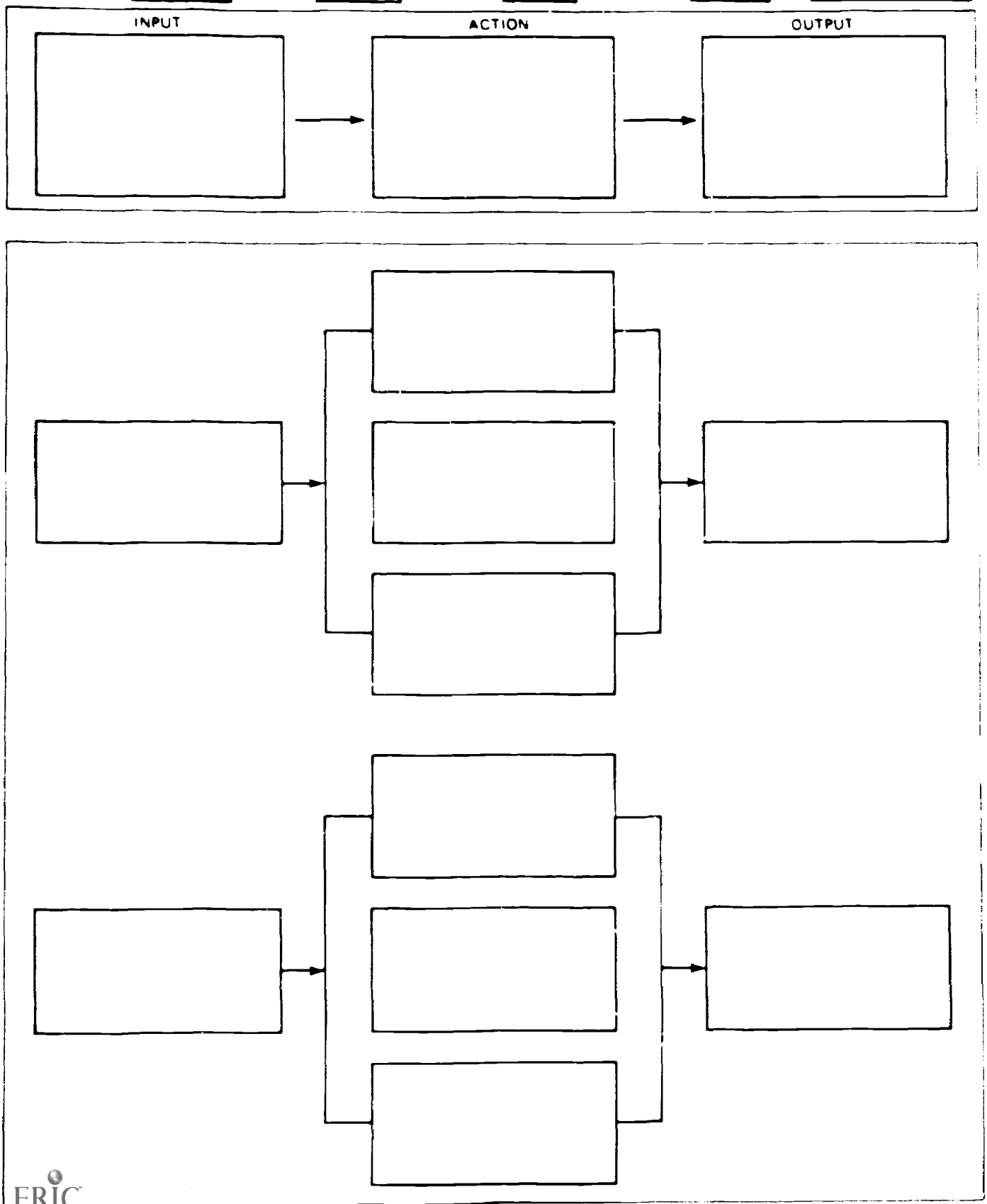


b. TASK ANALYSIS



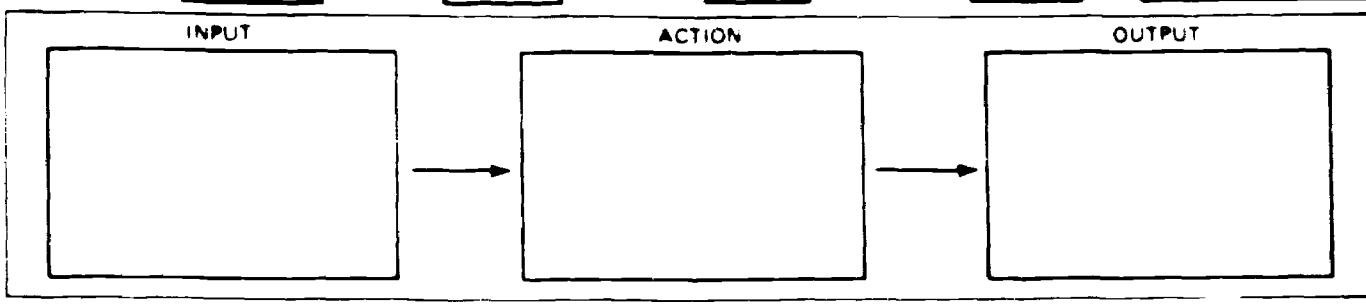
Form A 5(14) SUPPLEMENTARY

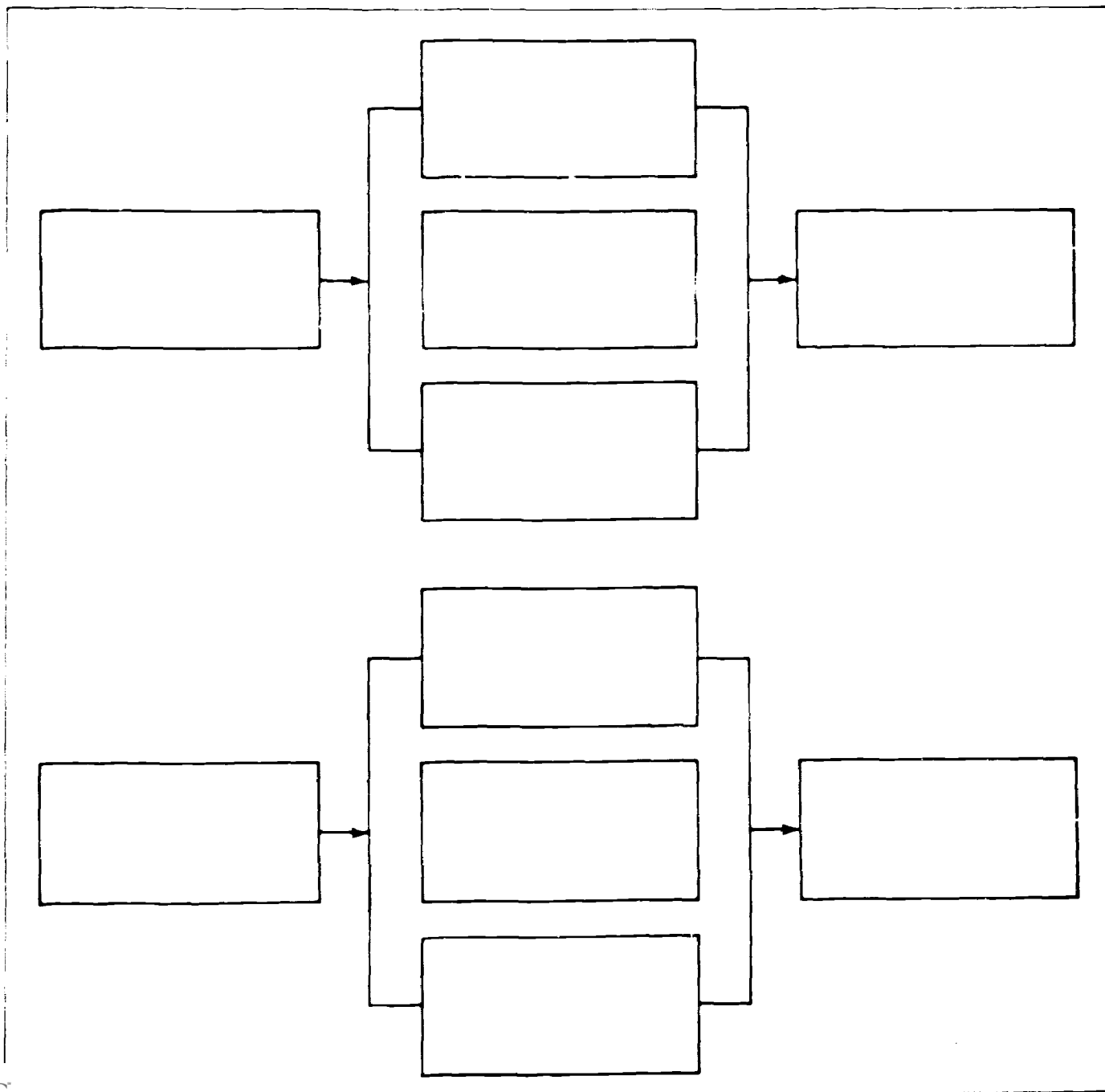
for AREA | TOPIC | SUB-TOPIC | BEHAVIOR | a. TASK DESCRIPTION



Form A 5(14) SUPPLEMENTARY

for AREA | TOPIC | Sub-TOPIC | BEHAVIOR | a. TASK DESCRIPTION

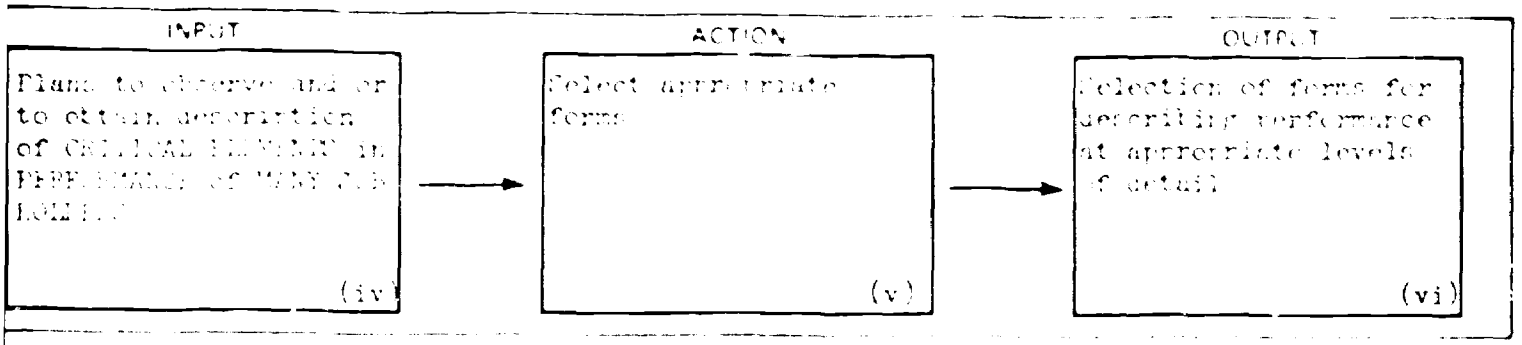




PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*The selection of FORMS needed to describe and analyze criterion behavior which includes "performance."*
WHAT YOU WILL WORK FROM	(1) Plans to describe the critical elements of job performance based on reports of performance by many job holders.
WHAT YOU WILL DO	(1) Select from available FORMS those necessary for describing and analyzing the criterion behavior.
FORMS YOU WILL USE	Available Forms -- A.5(1)-(3) and A.5(15)-(16)

DESCRIPTION OF Sub STEP	A.5.2(c)



Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Ease in describing performance . . .176	-MATRIX: Selecting forms to describe performance at different levels of detail 177		A.5(1)-A.5(3) . . . . . 179 A.5(15) . . . . . 195 or A.5(16) . . . . . 197 alternate

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of criterion behavior	A.1.1			A.5(1)-A.5(3) A.5(15)-A.5(16)-alternate
Selection of information-collecting techniques	A.2.2			

STEP A.5.2(c)

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Plans to observe and/or to obtain description of critical elements in performance of major job activities (iv)	Select appropriate forms (v)	Selection of forms for describing performance at appropriate levels of detail (vi)
Need to describe major areas of performance iv.a	Select appropriate forms v.a	Selection of forms capable of describing: -Tasks -Steps -Sub-steps vi.
Need to describe sub-areas and to identify critical skill elements iv.b	Select appropriate forms v.b	Selection of forms capable of describing: -Sub-steps -Critical skill elemen vi.

BACKGROUND INFORMATION

A.5.2(c)

CRITERIA FOR IDENTIFYING PROBABLE EASE OF INITIALLY DESCRIBING PERFORMANCE IN COMPREHENSIVE DETAIL

IDENTIFICATION MATRIX

CRITERIA	*Performance involves:* -*A single, long chain* -*Multiple, independent long chains*	*Performance involves:* -*A single, relatively short chain* -*Multiple, relatively short chains*
JUDGMENT OF EASE IN DESCRIBING PERFORMANCE	Relatively DIFFICULT to describe immediately and comprehensively at the lowest level of detail	Relatively EASY to describe immediately and comprehensively at the lowest level of detail
EXAMPLES	-Chairing a decision-making conference -Driving an automobile -Writing project reports -Developing a training program -Managing classroom behavior	-Sorting mail -Storing laboratory equipment -Playing children's games -Using calculator (adding and subtracting only)

A.5.2(c)

SELECTING FORMS FOR DESCRIBING PERFORMANCE AT DIFFERING LEVELS OF DETAIL

DECISION MATRIX

CONDITIONS	Relatively DIFFICULT to describe immediately and comprehensively at the lowest level of detail	Relatively EASY to describe immediately and comprehensively at the lowest level of detail
ACTION TO TAKE	*(1) Initially identify and describe broad, general areas of performance;* *(2) Follow up with description of critical incidents at a detailed level*	*(1) At the outset, obtain descriptions of critical incidents at a detailed level*
FORMS TO USE	Use FORMS A.5(1)-A.5(3) Summary of: -TASKS -STEPS -Sub-STEPS	Use FORM A.5(1) or A.5(1)-alternate Description of: -CRITICAL INCIDENTS
EXAMPLES OF DETAIL	BROAD LEVELS	Detailed CRITICAL INCIDENTS
e.g., chairing a conference	A. Planning and Scheduling Conference B. Helping Conferees to Prepare for Conference C. Setting Goals for Conference D. Developing Interest and Participation in Discussion E. Maintaining Conference Goals F. Helping Conferees to Understand Problems G. Developing Solutions to Problems H. Helping Conferees to Get Along with Each Other I. Resolving Differences of Opinion J. Getting Decisions Made K. Winning Support for Decisions L. Planning and Preparing for Future Action	INPUT: *Time available for conference was short* ACTION: *Scheduled too many topics for discussion* OUTPUT: *Many topics were not covered and decisions not made*

This section contains forms (in yellow) recommended for use when a small number of respondents describe the major tasks and steps involved in their own performance or in the performance of others. These forms are recommended when these respondents are interviewed.

CONTENTS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Let's see if we can get a big picture or an overview of what it is you do."

QUESTION

"What are the major tasks or functions involved when you _____ (activity)?"

ALTERNATES

"What are the major tasks or functions involved in performing a _____ (activity)?"

"What are the major tasks or functions involved in _____ (activity)?"

"What are the major tasks or functions involved in performing as a _____ (job title)?"

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."*

*If possible, provide an example from the performance area under study.

SPECIFIC EXAMPLES

QUESTION

"What are the major tasks or functions involved when you *write an essay*?"

ALTERNATES

"What are the major tasks or functions involved in performing *an orthopedic examination*?"

"What are the major tasks or functions involved in *building a curriculum*?"

"What are the major tasks or functions involved in performing as a *researcher*?"

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A. *Gathers clinical information*

B. *Uses special diagnostic information*

C. *Develops a diagnosis*

D. *Decides on appropriate care*

E. *Implements treatment*

F. *Provides continuing care*

Form A-5 (1)

SUMMARY OF **TASKS**

A

B

C

D

E

F

G

H

I

Form A-5 (1)

SUMMARY OF **TASKS**

K

L

M

N

Etc.

A.5.2(c) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v, vi

QUESTIONS FOR FORM A5 (2)

FOR SUMMARY OF STEPS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, let's see if we can identify the major steps within each task."

QUESTION A

"What are the major steps involved in _____ (Task A)?"

QUESTION A.1

"For Step 1, _____ (Step), what are the input conditions, the actions taken, and the resulting outputs?"

QUESTIONS A.2-A.n

Repeat same type of question as in A.1 for all steps in Task A.

QUESTIONS B-B.n

Repeat same type of question as A, then A.1-A.n, for all steps in Task B.

Repeat the above procedure for all tasks.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."

SPECIFIC EXAMPLES

"What are the major steps involved in gathering clinical information?"

"For Step 1, asking for a medical history, what are the input conditions, the actions to be taken, and the resulting outputs?"

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A. *Gathering clinical information*

A.1 Obtain a medical history

INPUT	ACTION	OUTPUT
Sources of information	*Ask about or check into patient's past medical history*	*Record of past illnesses*

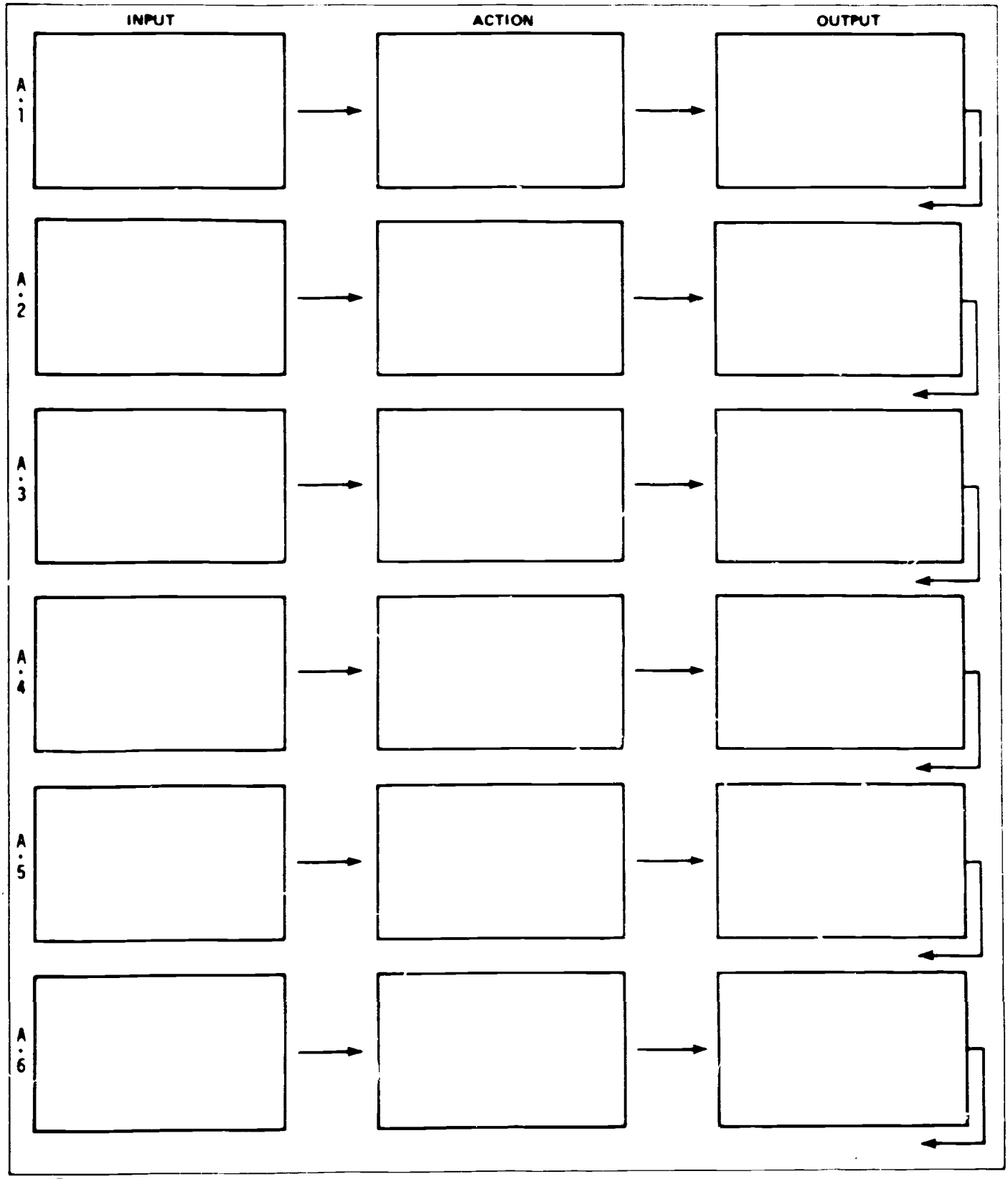
A.2 Perform a physical examination

Patient	*Perform all relevant examinations*	*Record of examination results*

Form A-5 (2)

for TASK [A]

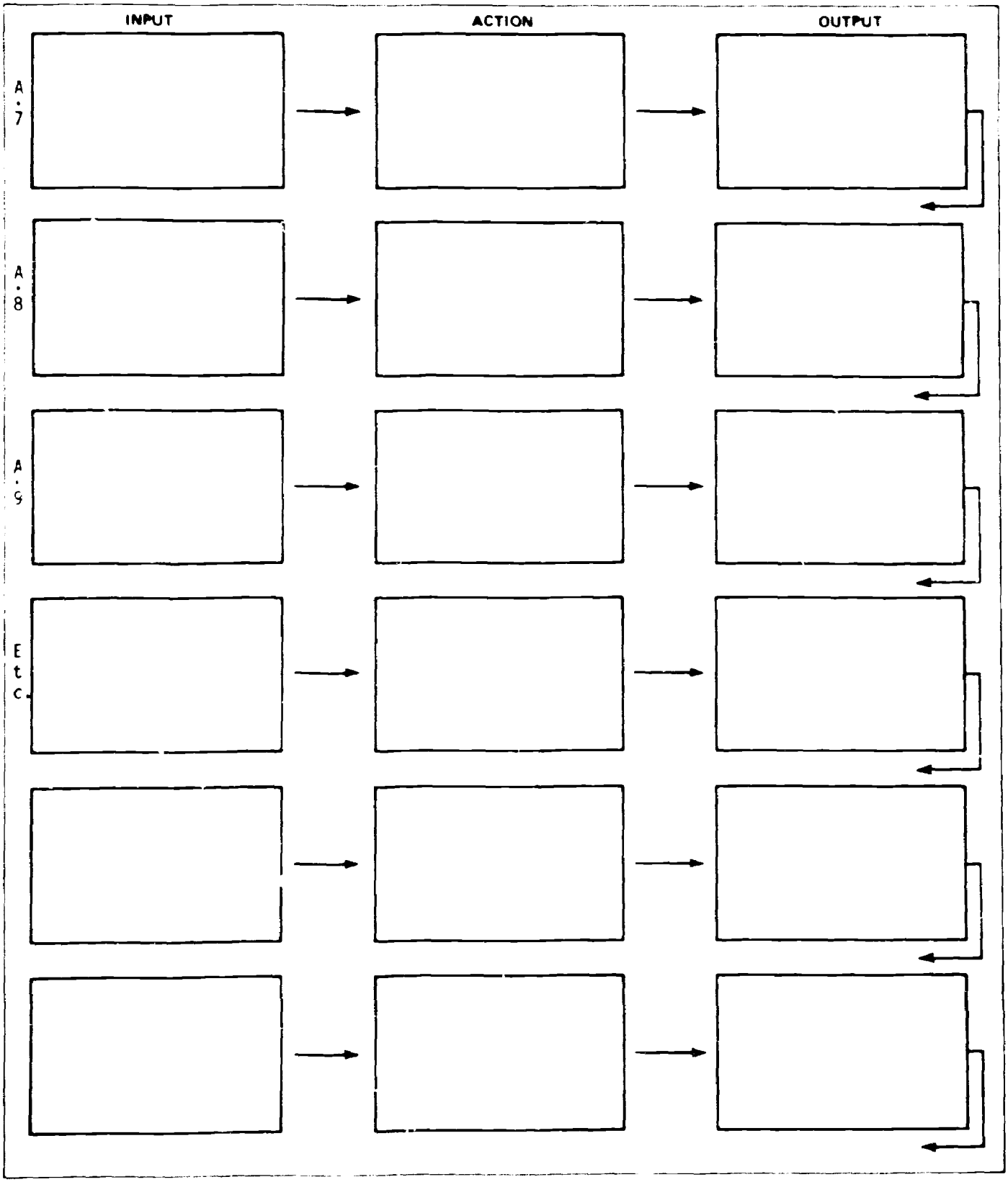
SUMMARY OF [STEPS]



Form A 5 (2)

for TASK [A]

SUMMARY OF [STEPS]



A.5.2(c)

RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii, iv, v, vi

QUESTION FORMAT A.1.3

FOR SUMMARY OF SUB-STEPS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT

"Now, let's see if we can identify the major sub-steps within each step."

QUESTION A.1

"What are the sub-steps involved in _____ (Step A.)?"

QUESTION A.1.1

For Sub-Step A.1.1, _____ (Sub-Step A.1.1), what are the input conditions, the actions taken, and the resulting outputs?"

QUESTIONS A.1.2-A.1.n

Repeat same type of question as in A.1.1 for all sub-steps in Step A.1.

Repeat same type of question as above for all sub-steps in all other steps in Task A.

Repeat the above procedure for all tasks.

PROVIDE AN EXAMPLE WHEN NECESSARY

STATEMENT

"Here's an example of what I mean."

SPECIFIC EXAMPLES

"What are the major sub-steps involved in *obtaining a medical history*?"

"For Sub-Step A.1.1, *asking the patient about his past illnesses*, what are the input conditions, the actions to be taken, and the resulting outputs?"

ILLUSTRATIVE ANTICIPATED RESULTS

PERFORMING AS AN ORTHOPEDIC SURGEON

A.1 Obtain a medical history

A.1.1 Ask patient for medical history

INPUT	ACTION	OUTPUT
Patient	Question about past illnesses	Identification of past illnesses

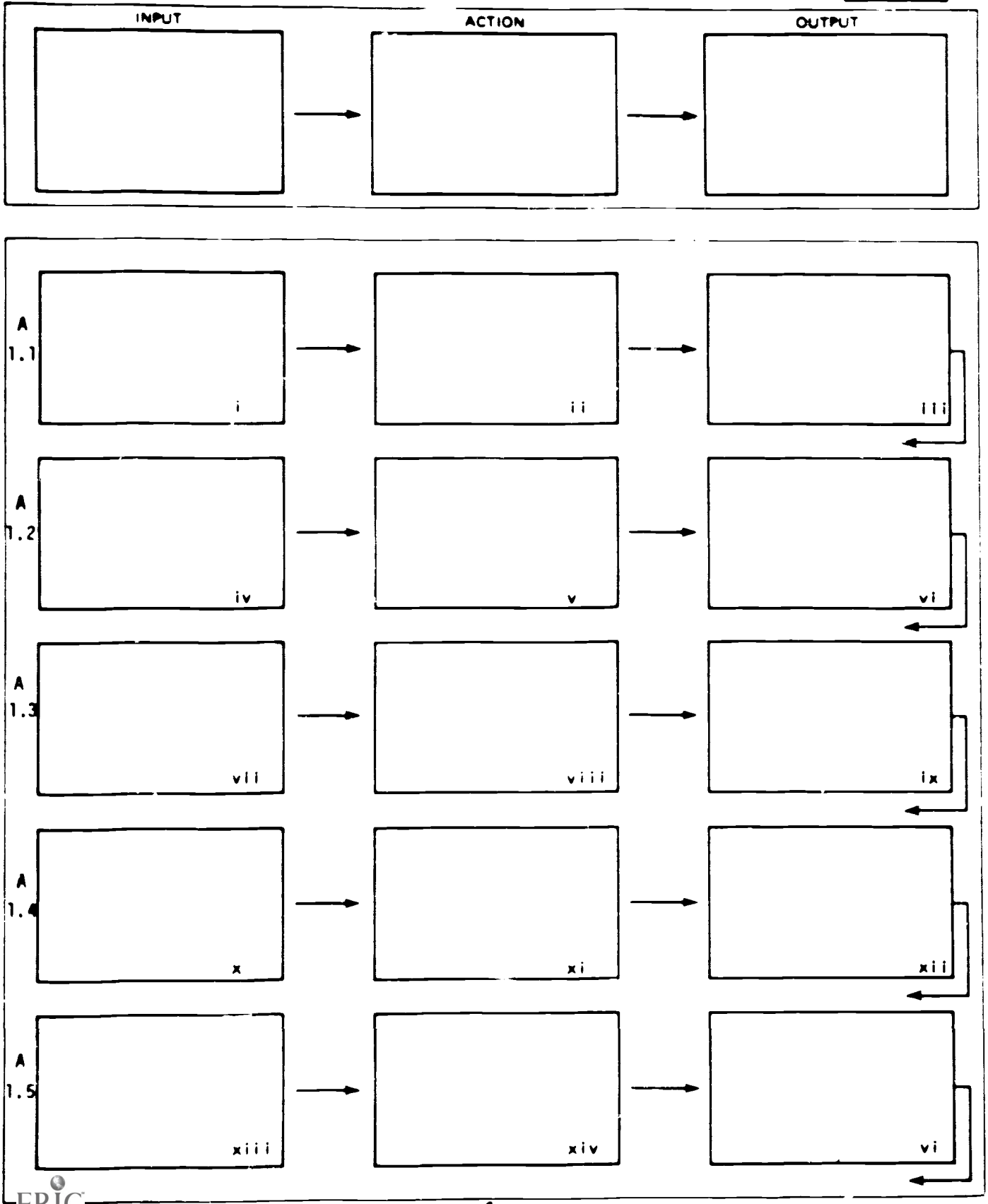
A.1.2 Check records for patient's history

Patient's medical record	Check records for history of illness	Identification of past illnesses

Form A 5 (3)

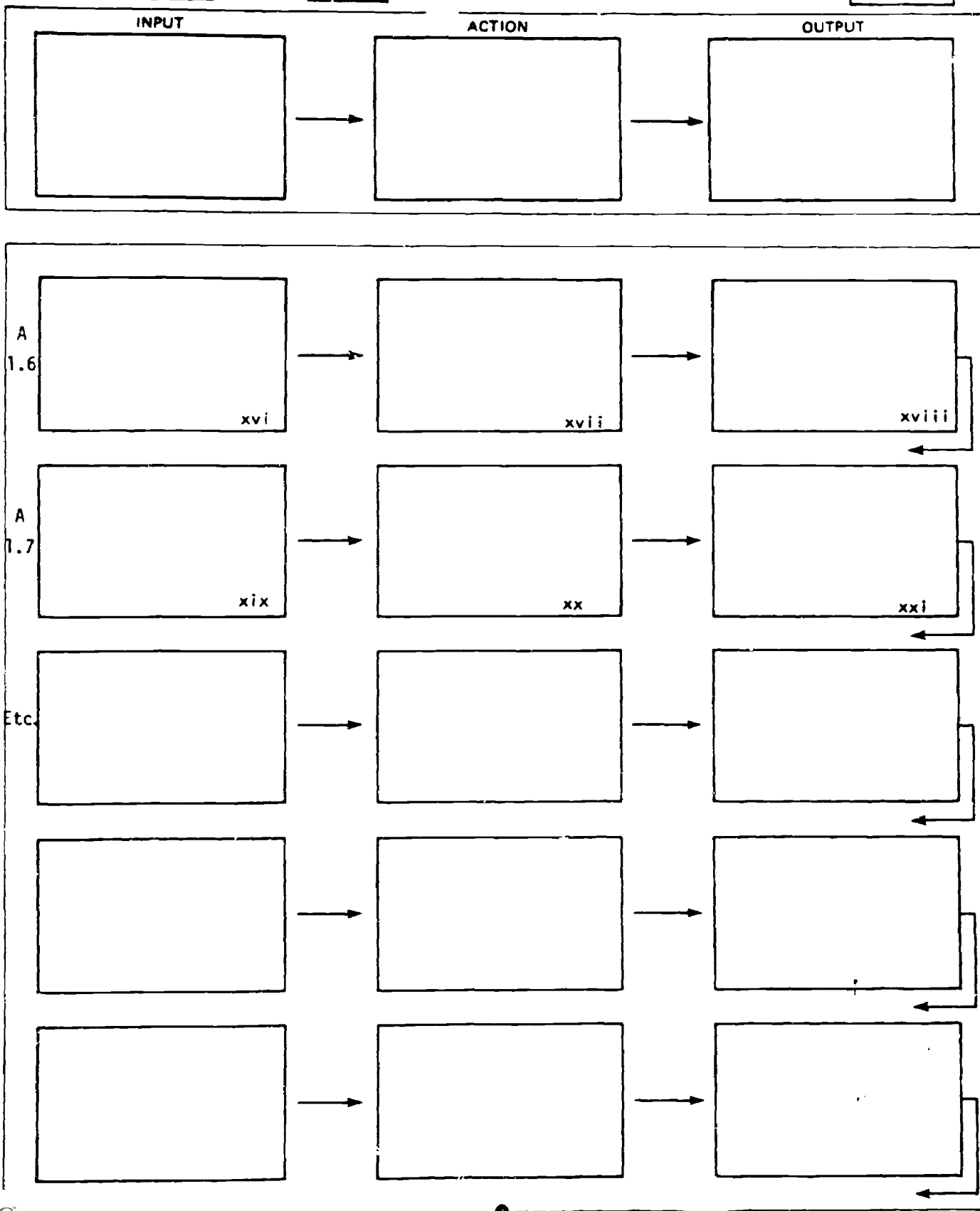
for TASK [A] STEP [1]

SUMMARY OF [Sub-STEPS]



Form A-5 (3)

for TASK A *STEP* 1 SUMMARY OF Sub-STEPS



A.5.2(c) RECOMMENDED LABELING SYSTEM FOR CROSS-REFERENCING PURPOSES

DECISION MATRIX

REFERENT	TASKS	STEPS	Sub-STEPS
RECOMMENDED LABELS	Capitalized Letters	Capitalized Letters + Arabic Numbers	Capitalized Letters + Arabic Numbers + Arabic Numbers + Lower Case Roman Numbers
EXAMPLES	A B C D E Etc.	A.1 A.2 A.3 Etc. B.1 B.2 B.3 B.4 Etc. C.1 C.2 Etc.	A.1.1 A.1.2 A.1.3 A.1.4 Etc. A.2.1 A.2.2 A.2.3 Etc. A.3.1 A.3.2 Etc. B.1.1 B.1.2 B.1.3 Etc. i, ii, iii iv, v, vi

This section contains forms (in yellow) recommended for use when many respondents describe the critical skill elements in their own performance or in the performance of others. These forms are recommended when respondents are interviewed or when they respond to a questionnaire.

CONTENTS

RECOMMENDED QUESTION FORMATS

ORIENTING STATEMENT #1

Your job is going to be to provide a complete description of something you actually did. A complete description covers all three phases: an INPUT, an ACTION, and an OUTPUT.

(1) Look at the example on the right-hand side of this page.
(2) Then, read the definition of INPUT, ACTION, OUTPUT in Row A. of Form A.5(15).

ORIENTING STATEMENT #2

Think of the last time you (he) were ______________ and
*task, step, or sub-step**
you took an action that resulted in a ______________.
particularly bad outcome, output

INSTRUCTIONS #1

Fill in Row B on Form A.5( ) describing:

(a) The specific INPUT situation that led you to take the wrong action you did.
(b) The specific wrong ACTION you took.
(c) The specific outcome that was particularly bad or unsuccessful.

INSTRUCTIONS #2

For the INPUT (a) situation you described in Row B, describe the specific correct ACTION you should have taken and what the outcome would have been (in Row C).

INSTRUCTIONS #3

In Row B, was the ACTION (b) which was inappropriate for INPUT (a) nevertheless appropriate to some other INPUT (d)? (If yes), describe it and what the outcome would be in Row D.

SPECIFIC EXAMPLES

Conference Leader

INPUT	ACTION	OUTPUT
Agenda topic	Devoted too much time to it	Inadequate time for other more important topics
Digression by a participant	Allowed it to continue	Poor understanding of the relevant issues by other participants

Think of the last time you (he) were *trying to win support for a conference decision* and you took an action that resulted in *lack of support*.

		Wrong Action	Bad Outcome
B.	Budget problem	Relied on judgment of marketing expert	Poor evaluation of nature of budget problem
C.	X	Relied on judgment of budget expert	Correct evaluation of budget problem
D.	Marketing problem	X	Correct evaluation of marketing problem

Form A.5(15)

for TASK [ ] STEP [ ] Sub-STEP [ ] a. TASK DESCRIPTION

	1. INPUT (noun phrase)	2. ACTION (verb)	3. OUTPUT (noun phrase)
A.	*What was the specific* *-Problem* *-Condition* *-Situation* *-Signal* *-Object* *-People or their behavior* *-Event* *which started, prompted, or led to your action?*	*What specifically did you/he do that was wrong?*	*What was the specific* *-Result* *-Product* *-Outcome* *that was: wrong, unsuccessful, a failure, or not up to standards?*

B.

a.

Wrong Action You Took

b.

Bad Outcome

c.

C.

Right Action to Take

Correct Outcome

D.

Other INPUT Situation

d.

Correct Outcome

Form A 5(15)

for TASK [ ] STEP [ ] SUB-STEP [ ] a. TASK DESCRIPTION

	1. INPUT (noun phrase)	2. ACTION (verb)	3. OUTPUT (noun phrase)
A.	*What was the specific* *-Problem* *-Condition* *-Situation* *-Signal* *-Object* *-People or their behavior* *-Event* *which started, prompted, or led to your action?*	*What specifically did you/he do that was wrong?*	*What was the specific* *-Result* *-Product* *-Outcome* *that was: wrong, unsuccessful, a failure, or not up to standards?*

B.

a. → Wrong Action You Took: b. → Bad Outcome: c.

C.

[X] → Right Action to Take → Correct Outcome

D.

Other INPUT Situation: d. → [X] → Correct Outcome

ALTERNATE Form A.5(16)

DESCRIPTION OF AN EFFECTIVE CRITICAL INCIDENT

INSTRUCTIONS

Think of the last time you did a particularly effective job of

_____.

task, sub-step, sub-sub-step

INPUT *e.g.,* *-Problem* *-Condition* *-Situation* *-Signal* *-Object* *-Event* *-People or their behavior*	What was the specific situation or occasion which prompted you or led you to do what you did?
ACTION *e.g.,* *What you did*	What, specifically, did you do that was effective?
OUTPUT *e.g.,* *-Result* *-Outcome* *-Product*	What was the specific outcome that resulted from the action you took? Why was your action effective?

DESCRIPTION OF AN INEFFECTIVE CRITICAL INCIDENT

INSTRUCTIONS

Think of the last time you did a particularly ineffective job of

_____.

task, sub-step, sub-sub-step

INPUT

e.g.,
-Problem
-Condition
-Situation
-Signal
-Object
-Event
-People or their behavior

What was the specific situation or occasion which prompted you or led you to do what you did?

ACTION

e.g.,
What you did

What, specifically, did you do that was ineffective?

OUTPUT

e.g.,
-Result
-Outcome
-Product

What was the specific outcome that resulted from the action you took? Why was your action ineffective?

A.5.2(c)

POSSIBLE VARIATIONS IN INSTRUCTIONS TO BE USED ON ALTERNATE FORM A.5(16)

RECOMMENDED INSTRUCTION FORMATS

1. NEGATIVE incident

(a) "Think of the last time you were _____ *task, step, or sub-step* and you took an action that resulted in _____ *a particularly bad outcome or effect*."

OR

(b) "Think of the last time you were _____ *task, step, or sub-step* and you took an action which interfered with _____ *outcome, product, result*."

2. POSITIVE incident

(a) "Think of the last time you were _____ *task, step, or sub-step* and you took an action that resulted in _____ *a particularly good outcome or effect*."

(b) "Think of the last time you were _____ *task, step, or sub-step* and you took an action which _____ *promoted a good/successful outcome*."

SPECIFIC EXAMPLES

1. NEGATIVE incident

(a) "Think of the last time you were *describing a test item* and you took an action that resulted in *students' not understanding the item*."

OR

(b) "Think of the last time you were *writing a report* and you took an action which interfered with *the accomplishment of your objective*."

2. POSITIVE incident

(a) "Think of the last time you were *teaching a concept* and you took an action that resulted in *students' easily understanding it*."

(b) "Think of the last time you were *driving a car* and you took an action which *avoided an accident*."

PREVIEW OF THE NEXT SubSTEP

YOUR PRODUCT	*Empirically revised FORMS and information collection procedures.*
WHAT YOU WILL WORK FROM	(1) Developed or selected FORMS and information collection procedures.
WHAT YOU WILL DO	(1) Submit the information collecting process to a sample test. (2) Revise and upgrade on the basis of revealed weaknesses.
FORMS YOU WILL USE	None

DESCRIPTION OF Sub-STEP	A.5.3

INPUT	ACTION	OUTPUT
Forms and procedures developed for or selected and adapted for specific information-collection need vii	Try out forms and procedures (including questions) and revise on the basis of tryout results viii	Information-collecting forms and procedures suitable for describing and analyzing criterion behavior under study ix

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Acceptability of information collection techniques . . 209	-MATRIX: Adapting forms and questions . . . 207 -MATRIX: Revising information-collecting forms, questions, procedures . . . 210	-MATRIX: Desirable sampling properties . . 205	

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Newly developed forms	A.5.1			Selection from among FORMS A.5(1)-A.5(16)
Selection of existing forms	A.5.2			

Sub-STEP A.5.3

JOB DIAGRAM I

	INPUT	ACTION	OUTPUT
	Forms and procedures developed for or selected and tested for specific information-collection need — vii	Try out forms and procedures (including questions) and revise on the basis of tryout results — viii	Information-collecting forms and procedures suitable for describing and analyzing criterion behavior under study — ix

Sub-Sub-STEPS

1	Need to obtain sample results — vii.1	Select respondents and portion of criterion behavior — viii.1	Selection of sample — ix.1
2	Forms and questions recommended in this volume unadapted either for criterion behavior under study or method of information collection — vii.2	Adapt forms and questions — viii.2	Forms ready for tryout — ix.2
3	Sample of respondents for tryout AND appropriate forms — vii.3	Submit forms and procedures (including questions) to informants — viii.3	Tryout results — ix.3
4	Tryout results — v.i.4	Revise forms and procedures (including questions) — viii.4	Type of information required for describing and analyzing criterion behavior — ix.4

BACKGROUND INFORMATION

Sub-Sub-STEP A.5.3.1

JOB DIAGRAM II

INPUT	ACTION	OUTPUT
1 Need to obtain sample results vii.1	Select respondents and portion of criterion behavior viii.1	Selection of sample ix.
Plans to use single expert to describe KNOWLEDGE DOMAIN or PERFORMANCE vii.1.a	Select sample of criterion behavior that will be described viii.1.a	Selection of sample of criterion behavior that permits tryout assessment of all relevant forms, procedures, and questions ix.1.
Plans to use many job holders to describe PERFORMANCE vii.1.b	Select sample of respondents who will provide information and sample of criterion behavior that will be described viii.1.b	Selection of sample of respondents and of criterion behavior that permits tryout assessment of all relevant forms, procedures, and questions ix.1.

A.5.3

STANDARDS MATRIX

TYPES OF SAMPLES NEEDED TO ASSURE ADEQUATE TRYOUTS OF FORMS, PROCEDURES, OR QUESTIONS

REQUIREMENTS	Sample of CRITERION BEHAVIOR	Sample of RESPONDENTS
DESIRABLE PROPERTIES OF SAMPLE	*A sufficient number of areas of criterion behavior is sampled to allow tryout of all relevant forms and questions associated with them*	*A sufficient number of respondents --approximately 10-20 in number-- to provide a reliable assessment of how well questions are understood and whether the questions produce relevant types of information*
EXAMPLES	-When subject matter areas are under study, tryout of forms, questions, and procedures suitable for PERFORMANCE and for KNOWLEDGE DOMAIN requires sampling of both types of criterion behavior -When criterion behavior under study involves many separate and non-contingent tasks, varied tasks should be sampled to allow tryout of forms for descriptions of criterion behavior at varying levels of detail which may be required by the separate tasks	-When critical skill elements are described on the basis of descriptions by many job holders, the adequacy of questions (either oral or in print) to elicit appropriate types of information is necessary

Sub-Sub-STEP A.5.3.2

JOB DIAGRAM III

	INPUT	ACTION	OUTPUT
2	Forms and questions recommended in this volume unadapted either for criterion behavior under study or method of information collection vii.2	Adapt forms and questions viii.2	Forms ready for tryout ix.2

I

	INPUT	ACTION	OUTPUT
	Type of criterion behavior I vii.2.a	Revise general form of recommended questions viii.2.a	Questions appropriate to type of criterion behavior ix.2.a
	Type of criterion behavior n vii.2.b	Revise general form of recommended questions viii.2.b	Questions appropriate to type of criterion behavior ix.2.b

II

	INPUT	ACTION	OUTPUT
	Plans to collect information by means of INTERVIEWS vii.2.a	Adapt forms and questions viii.2.b	Questions and forms appropriate to method ix.2.b
	Plans to collect information by means of QUESTIONNAIRES vii.2.b	Adapt forms and questions viii.2.b	Questions and forms appropriate to method ix.2.b
	Plans to collect information by means of DIRECT OBSERVATION vii.2.c	Adapt forms and questions viii.2.c	Questions and forms appropriate to method ix.2.c

A.5.3.2

ADAPTING INFORMATION-COLLECTION TECHNIQUES TO SUIT SPECIFIC CRITERION BEHAVIOR UNDER STUDY AND METHODS SELECTED TO COLLECT IT

DECISION MATRIX

CONDITION	Need to tailor questions and forms to specific type of criterion behavior	Need to tailor questions and forms to methods of information collection: interview, observation, questionnaire, etc.
ACTION TO TAKE	*Adapt general form of questions recommended in* Sub-STEP A.5.2 *to needs of the specific criterion behavior under study*	*Create forms appropriate to method of data collection to be used*
EXAMPLES	(See illustrative examples provided with lists of questions) Sub-STEP A.5.2	-Prepare questionnaire when form is to be mailed (rather than used in an interview)

Sub-Sub-STEP A.5.3.4

JOB DIAGRAM IV

	INPUT	ACTION	OUTPUT
4	Tryout results vii.4	Revise forms and procedures (including questions) viii.4	Type of information required for describing and analyzing criterion behavior ix.4

	Information collect on forms, procedures and questions ACCEPTABLE as shown by tryout results vii.4.a	Make no changes viii.4.a	Acceptable information collection forms, procedures, and questions READY ix.4.a
	Information collection forms, procedures, and questions UNACCEPTABLE as shown by tryout results vii.4.b	Make changes in formats of forms, wording of questions, etc. viii.4.b	Acceptable information collection forms, procedures, and questions READY ix.4.b

A.5.3.4

CRITERIA FOR DETERMINING ACCEPTABILITY OF QUESTIONS, FORMS, OR PROCEDURES FOR COLLECTING INFORMATION

IDENTIFICATION MATRIX

REFERENT	QUESTIONS	FORMS	PROCEDURES
CRITERIA FOR ACCEPTABILITY	-Are understood by respondents -Elicit required types of information -Description of inputs, actions, and outputs -Identification of discriminations, generalizations, and chains -Different levels of detail	-Provide adequate space for recording of information -Formats readily lead to recording of different types of information in appropriate forms or to its recording in the appropriate place on the form (i.e., formats suggest the type of information that goes on it)	-Oral questioning, use of questionnaires, or observation of performance lead to acceptable descriptions -Sequence of questioning leads to appropriate sequence of responses

A.5.3.4

STEPS TO TAKE IN REVISING INFORMATION COLLECTION FORMS, QUESTIONS, OR PROCEDURES

DECISION MATRIX

CONDITIONS	QUESTIONS are Unacceptable	FORMS are Unacceptable	PROCEDURES are Unacceptable
ACTION TO TAKE	-Revise wording of questions while respondent is present until he understands what type of information the question is designed to elicit -Add questions if some types of information are not elicited by original questions	-Revise formats to allow adequate space -Revise formats so that the correct form is easily selected for recording type of information appropriate to it	-Switch from an unacceptable approach to another -From questionnaire to oral description -From observation to oral description -From oral description to observation

STEP A.5

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.5.1			-Forms to use in collecting information about criterion behavior	
A.5.2(a)		-Selected forms for describing PERFORMANCE based on information of a <u>single</u> expert		
		OR		
A.5.2(b)		-Selected forms for describing KNOWLEDGE DOMAIN based on information of a <u>single</u> expert		
		OR		
A.5.2(c)		-Selected forms for describing PERFORMANCE based on information provided by <u>many</u> job holders		
A.5.3	-Acceptability of information-collection forms, questions, or procedures	-Selected sample of criterion behavior or of respondents for tryout	-Revised <u>unacceptable</u> forms, questions, or procedures	